Minerals Yearbook

1983

Volume III

AREA REPORTS: INTERNATIONAL

U.S. DEPARTMENT OF THE INTERIOR
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BUREAU OF MINES

UNITED STATES DEPARTMENT OF THE INTERIOR • Donald Paul Hodel, Secretary

BUREAU OF MINES • Robert C. Horton, Director

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities to protect and conserve our land and water, energy and minerals, fish and wildlife, and park and recreation areas, and for the wise use of all those resources. The Department also has a major responsibility for American Indian reservation communities and for the people who live in Island Territories under U.S. administration.

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Foreword

This edition of the Minerals Yearbook discusses the performance of the worldwide mineral industry during 1983 and provides background information to assist in interpreting developments during the year being reviewed. Content of the individual volumes follows:

Volume I, Metals and Minerals, contains chapters on virtually all metallic and nonmetallic mineral commodities important to the U.S. economy. In addition, it includes a statistical summary chapter, a chapter on mining and quarrying trends, and a chapter discussing the statistical surveying methods used by the Bureau of Mines.

Volume II, Area Reports: Domestic, contains chapters on the mineral industry of each of the 50 States, the U.S. island possessions in the Pacific Ocean and the Caribbean Sea, and the Commonwealth of Puerto Rico. This volume also has a statistical summary.

Volume III, Area Reports: International, contains the latest available mineral data on more than 130 foreign countries and discusses the importance of minerals to the economies of these nations. A separate chapter reviews the international mineral industry in general and its relationship to the world economy.

The Bureau of Mines continually strives to improve the value of its publications to users. Therefore, constructive comments and suggestions by readers of the Yearbook will be welcomed.

Robert C. Horton, *Director*

Acknowledgments

The Bureau of Mines, in preparing volume III, utilized extensively statistics and data on mineral production, consumption, and trade provided by various foreign government mineral and statistical agencies through various official publications. The cooperation and assistance of these organizations is gratefully acknowledged. Statistical and informational material was also obtained from reports of the U.S. Department of State, from United Nations publications, and from the domestic and foreign technical and trade press. Of particular assistance were the routine and special reports submitted by the minerals, petroleum, economic, and commercial officers and other members of the Department of State. Their contributions are sincerely appreciated.

The text and tables of this volume were prepared by the staff of the Division of Foreign Data, Assistant Directorate, Minerals Information. Final correlation and checking of this volume was performed by the Division of Publication.

The regimes of some countries reviewed in this volume are not recognized by the U.S. Government. The information contained herein is technical and statistical in nature and is not construed as conflicting with or being contradictory of U.S. policies toward these countries.

Albert E. Schreck, *Chief, Division of Publication*

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Minerals in the World Economy

By Charles L. Kimbell[1] and John Panulas[2]

Although virtually every available indicator of world mineral industry activity demonstrated a gain in 1983 relative to the 2 very poor years of 1981 and 1982, the overall prospects for future years seemed far from bright. There were significant upturns in the quantity and value of mineral commodities produced, traded, and consumed in 1983, and many nonfuel mineral prices advanced, although the price advances in current dollars in most instances barely compensated for inflation. The pattern of investment in exploration and development of new mining ventures and new plant construction reflected virtual industry-wide concern that substantial upturns in demand for mineral commodities in the near future were unlikely, at least for most large volume products. The world oil glut continued despite cutbacks in production, and substantial stocks of many other mineral commodities mitigated against growth in total productive capacity, at least among market economy nations. In these countries, development activity at both mines and plants was confined largely to programs aimed at substituting new, more efficient installations for old, uneconomic or marginally economic plants. Among the centrally planned economy countries, the pattern was somewhat different on the whole, but even there, growth in total productive capacity was evidently somewhat restrained, although it seemed questionable whether the restraint was a function of intentional planning or simply an inability to accomplish planned programs on schedule.

International political events, particularly the Iran-Iraq war and the unstable situation in the eastern Mediterranean countries (Lebanon, Israel, and Syria), continued to adversely affect mineral industry activities in those areas. Similarly, the internal and international conflicts in Central America negatively influenced mineral industry operations there. In Afghanistan, it appeared that there was some upturn in the very modest mineral industry operations, but industry activities there undoubtedly continued to be affected by confrontations between the Soviets and the local citizenry.

PRODUCTION

The estimated value of world crude mineral production in 1983 was nearly $520,000 million in terms of 1978 dollars, slightly greater than the results for 1982, but far short of the historic high of 1979. The following tabulation summarizes the estimated value of world crude mineral production for 1978-83 and selected years prior to 1978:

Year	Billion constant 1978 dollars	
	Value of 53[1] major crude mineral commodities[2]	Value of all crude mineral commodities[3]
1950	67.8	77.2
1953	88.5	101.7
1958	113.6	136.5
1963	125.7	154.0
1968	145.6	176.5
1973	234.0	281.6
1978	478.9	539.7
1979[r]	504.0	568.0
1980[r]	493.8	556.5
1981[r]	484.5	546.0
1982[r]	459.8	518.2
1983	461.1	519.7

[r] Revised.

[1] The list of commodities included appears in table 3 of this chapter; one commodity covered in 1950-68 (beryl) is excluded from the 1973-81 figures, but the overall impact of this omission is regarded as insignificant.

[2] Data for all years prior to 1979 are as reported in Annales des Mines, Nov.-Dec. 1980, p. 173; data for 1979-83 are extrapolated from the 1978 Annales des Mines figures on the basis of the United Nations index of extractive industry production in the United Nations Monthly Bulletin of Statistics, Aug. 1983, p. xiv.

[3] Data extrapolated from values of 53 commodities to compensate for other mineral products. For details on the basis for this extrapolation, see accompanying text under "Value of World Mineral Production."

The foregoing data on value of crude mineral output do not completely portray the total role of the mineral industry in the world economy in that they represent only the value of crude mine output (raw material from mines, quarries, and wells) rather than the considerably enhanced value that results from beneficiation, smelting, refining, and other equivalent downstream processing. If the value added through such processing were included, a 1983 figure of $1,222,000 million (1978 dollars) could be regarded as a conservative estimate of the value of output of mineral industry plants operating from primary materials only. An additional unestimated increment should also be included for the value of those processed materials recovered from secondary sources—scrap and other reclaimed materials.

It should be stressed that crude and processed mineral commodities constitute not only the overwhelmingly dominant share of the total raw material base for all manufacturing operations but also, in the form of fertilizers, are a vital material for the agricultural sector, and the only significant source of energy for all sectors of the world's economy.

PRODUCTION INDEX PATTERNS

The following tabulation summarizes the development pattern in world extractive mineral industry output as reflected by United Nations indexes:

Year	Index numbers (1975=100)			
	Coal	Crude petroleum and natural gas	Metals	Extractive industry total
Annual averages:				
1978	100.7	116.4	101.1	112.7
1979	105.7	122.5	103.7	118.6
1980	109.3	117.8	106.2	116.2
1981	108.5	115.4	104.1	114.0
1982	111.3	107.1	99.1	108.2
1983	110.8	107.1	100.9	108.5
Quarterly results:				
1982:				
1st quarter	114.3	103.5	104.5	106.5
2d quarter	114.7	110.5	104.0	111.8
3d quarter	106.3	110.8	93.4	109.5
4th quarter	110.0	103.4	94.3	105.1
1983:				
1st quarter	111.7	93.0	98.7	98.7
2d quarter	110.3	108.9	103.8	109.9
3d quarter	107.9	118.0	99.1	115.5
4th quarter	113.4	108.4	101.9	109.8

Source: United Nations. Monthly Bulletin of Statistics. V. 38, No. 8, Aug. 1984, p. xiv.

The tabulation shows that despite significant differences in results for the three major components through the various quarters of 1982 and 1983, the aggregate reached a low point in the first quarter of 1983 and substantially recovered in the second and third quarters of that year. Although an average for the first three quarters of 1983 has been entered as a tentative result for 1983 in the absence of a complete figure, it is unlikely that the actual results will match the figures entered. Available information on major commodities suggest that the final figures for coal and for metals will exceed that for 1982 and the tentative 1983 level; while that for petroleum and natural gas liquids will be lower than the 1982 level as well as the tentative 1983 level.

Comparison of world extractive industry production indexes in the foregoing tabulation, with indexes from the same source for the processing sectors of the mineral industry presented in the following tabulation, demonstrate that the recessionary low points for the crude mineral extraction sector and the mineral processing sector are significantly offset:

Year	Index numbers (1975=100)		
	Non-metallic mineral products	Chemicals, petroleum, coal, and rubber products	Base metals
Annual averages:			
1978	117.7	125.6	115.0
1979	122.4	131.9	120.2
1980	123.4	131.8	116.3
1981	121.9	133.0	115.5
1982	119.0	131.4	106.2
1983	123.6	138.5	109.4
Quarterly results:			
1982:			
1st quarter	116.2	133.4	113.4
2d quarter	124.0	133.5	111.1
3d quarter	118.6	128.7	100.5
4th quarter	117.1	130.2	99.8
1983:			
1st quarter	117.9	135.5	107.8
2d quarter	128.1	140.1	111.9
3d quarter	124.4	138.8	106.0
4th quarter	124.1	139.7	112.0

The results for various world areas that were aggregated to produce the foregoing tabulations differed greatly. For region-by-region details too extensive to include here, the reader is referred to the source publications for the foregoing tabulations.

QUANTITATIVE COMMODITY OUTPUT

Of the 95 distinct mineral commodities and/or forms of mineral commodities for which total world production, as measured by the U.S. Bureau of Mines, is listed in table 1 for 1979-83,[3] 48 registered increases in 1983 relative to the 1982 level of production. Of the remainder, 46 registered declines and 1 was unchanged relative to 1982 performance. This was a marked improvement over the previous year, when gains over 1981 performance were achieved by only 26 commodities, with 69 registering declines, and over 1981, when only 33 commodities exceeded 1980 levels, with 60 recording declines and 2 registering unchanged output levels.

Of the 48 commodities showing gains in output between 1982 and 1983, 30 had registered declines between 1981 and 1982, 8 showed gains for a second year in a row, 4 registered increases for a third consecutive year, 2 recorded increases for the fourth consecutive year, and 4 showed gains for a fifth consecutive year. Of the 46 commodities recording declines, 7 had recorded increases between 1981 and 1982, 12 registered declines for a second year, 15 recorded lower output levels for a third consecutive year, 10 showed lower output levels for a fourth consecutive year, and 2 registered lower output levels for a fifth consecutive year. The single commodity with no gain between 1982 and 1983 had recorded an increase between 1981 and 1982.

Of the 50 listed metallic commodities, 24 were produced in greater quantities in 1983 than in 1982. Notable were continued growth in mine output of gold and silver, and an upturn in mine output of platinum; these were in contrast to downturns registered for 19 of the 28 metallic mine products listed. The three precious metals showing gains were joined by bismuth, chromite, monazite, nickel, and zinc; in contrast, most major metallic mine products—iron ore, bauxite, manganese, copper, lead, and ilmenite—together with 14 others recorded declines. The pattern was somewhat different among the 22 processed metal commodities reported; 15 showed gains, with upturns reported for pig iron, steel, alumina, primary smelter lead, primary and secondary zinc, primary refined copper, and primary refined lead, together with 5 lesser metals. Among the seven processed metal commodities that showed declines between 1982 and 1983, ferroalloys, primary smelter copper, and secondary refined copper were probably most noteworthy.

Of the 35 nonmetallic commodities surveyed, 20 showed increases between 1982 and 1983, with cement, diamond (gem and industrial), gypsum, nitrogen, phosphate rock, and potash notable among the gainers, while the more notable nonmetallic commodities showing declines included barite and sulfur.

Of the 10 fuel mineral commodities (excluding uranium, which is included under metals), 4 showed increases between 1982 and 1983, including bituminous and lignite coal and natural gas; in contrast, crude and refined petroleum output both were lower for the fourth consecutive year.

The overall performance of the nonfuel mineral industry can only be summarized in terms of the value of production, and for these commodities, exactitudes on value on a commodity-by-commodity basis are not available for any year subsequent to 1978. Among the fuel commodities, however, the overall pattern of output change can be demonstrated using United Nations data, in which all fuels are adjusted to a common energy equivalent basis. The following tabulation summarizes world energy commodity output for 1978-82 as reported by the United Nations, with U.S. Bureau of Mines estimates for 1983:

Year	Million metric tons of standard coal equivalent				
	Coal	Crude petroleum and natural gas liquids	Natural gas	Hydro and nuclear electricity	Total
1978	2,450	4,524	1,765	275	9,014
1979	2,583	4,718	1,855	288	[1]9,445
1980[r]	2,619	4,500	1,838	301	[1]9,257
1981[r]	2,629	4,247	1,852	320	9,048
1982	[r]2,712	4,035	[r]1,852	[r]334	[r]8,933
1983[e]	2,739	4,022	1,857	352	8,970

[e] Estimated. [r] Revised.

[1] Data do not add to total shown because of independent rounding.

Sources: 1978-79: United Nations. 1981 Yearbook of World Energy Statistics. New York, 1983, p. 2; 1980-82: United Nations. 1982 Energy Statistics Yearbook. New York, 1984, p. 2; 1983: U.S. Bureau of Mines estimates.

Table 1.—World production of major mineral commodities[1]

Commodity	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum:					
Bauxite, gross weight[2] thousand metric tons	87,102	90,795	87,103	79,373	77,596
Alumina, gross weight do.	31,429	33,489	32,184	28,195	29,530
Unalloyed ingot metal do.	14,526	15,369	15,062	13,302	13,854
Antimony, mine output, metal content metric tons	63,080	63,521	57,265	53,775	48,354
Arsenic, white[3] [4] do.	29,620	28,619	27,872	26,264	25,276
Beryl concentrate, gross weight[3] [4] do.	2,397	2,561	2,901	3,097	2,893
Bismuth[3] do.	3,424	3,608	3,688	3,991	4,053
Cadmium metal, smelter do.	18,679	18,231	17,364	16,452	17,244
Chromite, gross weight[4] thousand metric tons	9,323	9,467	8,762	7,954	8,085
Cobalt:					
Mine output, metal content metric tons	29,871	31,006	30,019	24,354	24,127
Metal, refined do.	28,509	30,220	25,779	1,640	1,829
Columbium-tantalum concentrate[4] [5] do.	35,166	36,637	35,567	25,520	14,383
Copper:					
Mine output, metal content thousand metric tons	7,691	7,739	8,191	8,072	8,027
Metal:					
Smelter:					
Primary[6] do.	7,543	7,485	7,870	7,771	7,756
Secondary[7] do.	471	462	476	510	548
Refined:					
Primary[6] do.	7,658	7,699	8,097	7,919	8,147
Secondary[7] do.	1,362	1,404	1,344	1,305	1,297
Gold, mine output, metal content thousand troy ounces	38,830	39,205	41,249	43,057	44,533

See footnotes at end of table.

Table 1.—World production of major mineral commodities[1] —Continued

Commodity	1979	1980	1981	1982[p]	1983[e]
METALS —Continued					
Iron and steel:					
Iron ore, gross weight thousand metric tons	902,985	895,867	855,060	781,307	739,133
Metal:					
Pig iron do.	531,910	512,344	500,704	455,457	463,794
Ferroalloys do.	16,024	16,008	15,058	13,909	13,755
Steel, crude do.	744,930	713,788	704,784	646,706	657,224
Lead:					
Mine output, metal content do.	3,451	3,448	3,349	3,408	3,324
Metal:					
Smelter:					
Primary[6] do.	3,275	3,171	3,107	3,162	3,209
Secondary[7] do.	2,352	2,198	2,238	2,093	2,024
Refined:					
Primary[6] do.	3,297	3,173	3,124	3,150	3,204
Secondary[7] do.	2,415	2,257	2,212	2,077	2,025
Magnesium metal, smelter, primary[8] metric tons	307,400	316,099	305,226	247,353	264,284
Manganese ore, gross weight thousand metric tons	26,276	26,396	23,495	24,139	22,433
Mercury, mine output, metal content 76-pound flasks	174,436	197,426	210,897	197,696	188,493
Molybdenum, mine output, metal content metric tons	104,031	109,649	109,373	94,050	62,533
Monazite concentrate (source of rare-earth metals and thorium) do.	22,371	20,619	19,592	16,167	21,330
Nickel:					
Mine output, metal content thousand metric tons	687	780	728	640	689
Metal, smelter do.	639	731	697	599	621
Platinum-group metals, mine output thousand troy ounces	6,487	6,848	6,931	6,431	6,482
Selenium metal, smelter[4] [5] metric tons	1,621	1,271	1,271	1,120	1,327
Silver, mine output, metal content thousand troy ounces	348,120	344,026	361,781	383,766	390,618
Tellurium metal, smelter[4] [5] metric tons	147	110	105	102	111
Tin:					
Mine output, metal content do.	245,294	247,300	253,113	237,176	211,620
Metal, smelter do.	249,337	249,236	247,832	239,213	222,035
Titanium concentrate, gross weight:					
Ilmenite[4] [9] thousand metric tons	3,547	3,718	3,615	3,003	2,609
Rutile[3] [4] do.	354	436	362	340	326
Titaniferous slag do.	764	1,219	1,129	1,050	993
Tungsten, mine output, metal content metric tons	48,593	51,897	49,011	45,305	38,882
Uranium oxide, mine output, U_3O_8 content[4] [5] do.	44,926	51,858	51,358	48,687	44,455
Vanadium, mine output, metal content do.	35,968	36,751	37,526	34,623	28,803
Zinc:					
Mine output, metal content thousand metric tons	5,985	5,962	5,848	6,238	6,246
Metal, smelter:					
Primary[6] do.	5,952	5,755	5,755	5,506	5,810
Secondary[7] do.	308	294	324	359	365
Zirconium concentrate[3] do.	629	680	635	709	711
NONMETALS					
Asbestos do.	4,695	4,699	4,337	4,080	4,157
Barite do.	7,257	7,531	8,197	7,491	5,759
Boron minerals do.	2,519	2,610	2,558	2,271	2,210
Bromine[4] do.	403	343	344	375	361
Cement, hydraulic do.	872,340	883,468	888,441	879,423	925,655
Clays:[4]					
Bentonite[5] do.	6,338	6,353	6,768	5,106	3,886
Fuller's earth[5] do.	1,828	1,762	1,921	2,010	2,224
Kaolin do.	20,104	20,767	20,516	19,140	20,155
Corundum, natural metric tons	26,366	29,081	22,420	18,976	17,585
Diamond:[4]					
Gem[e] thousand carats	10,235	10,626	10,451	10,382	21,037
Industrial[e] do.	29,195	33,251	32,106	33,985	35,082
Total do.	39,430	43,877	42,557	44,367	56,119
Diatomite[4] thousand metric tons	1,510	1,515	1,488	1,511	1,521
Feldspar[4] do.	3,113	3,158	3,226	3,397	3,485
Fluorspar do.	4,612	4,817	4,582	4,278	4,304

See footnotes at end of table.

Table 1.—World production of major mineral commodities[1] —Continued

Commodity	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Graphite[3] metric tons	626,431	610,590	601,878	586,653	585,436
Gypsum thousand metric tons	80,367	78,499	76,156	71,640	77,858
Iodine metric tons	11,135	11,605	12,025	12,254	13,437
Lime[4] thousand metric tons	117,630	117,195	115,099	107,122	108,088
Magnesite[3] do	10,935	11,577	11,137	10,994	10,977
Mica[4] do	233	227	239	215	243
Nitrogen: N content of ammonia do	70,884	73,548	76,335	74,693	76,840
Perlite do	1,469	1,526	1,441	1,412	1,390
Phosphate, gross weight:					
Phosphate rock do	131,825	139,214	138,169	122,202	134,626
Thomas slag do	4,982	4,560	3,381	2,825	2,765
Guano do	10	29	8	22	10
Potash, marketable, K_2O equivalent do	25,768	27,857	27,080	24,664	26,678
Pumice[4] [5] do	15,249	13,305	13,308	12,707	11,776
Salt do	173,415	168,940	171,428	165,137	165,598
Sodium compounds, n.e.s.:[4]					
Sodium carbonate do	28,188	28,347	28,106	27,549	28,361
Sodium sulfate do	5,503	5,431	5,470	4,900	4,744
Strontium minerals[4] [5] metric tons	95,776	92,527	122,113	111,383	109,960
Sulfur, elemental basis:					
Elemental[10] thousand metric tons	16,645	17,228	16,242	13,974	12,535
From pyrite do	9,838	10,292	10,205	9,892	9,946
Byproduct[11] do	26,744	27,400	26,903	26,910	27,991
Total do	53,227	54,920	53,350	50,776	50,472
Talc, soapstone, pyrophyllite do	6,866	7,535	7,226	6,839	6,853
Vermiculite[4] [5] metric tons	540,179	538,268	523,265	509,480	449,455
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[4] [5] thousand metric tons	4,154	4,185	4,179	3,964	4,239
Coal:					
Anthracite million metric tons	288	351	349	353	353
Bituminous do	2,510	2,499	2,498	2,597	2,621
Lignite do	940	963	992	1,026	1,041
Total do	3,738	3,813	3,839	3,976	4,015
Coke:[12]					
Metallurgical thousand metric tons	367,177	363,689	356,885	337,713	332,577
Other do	14,759	13,757	13,521	13,549	13,455
Gas, natural, marketed billion cubic feet	54,425	54,518	54,920	55,383	55,542
Natural gas liquids[4] million 42-gallon barrels	1,200	1,272	1,351	1,380	1,469
Peat thousand metric tons	270,044	305,852	351,332	372,610	375,131
Petroleum:					
Crude million 42-gallon barrels	22,918	21,896	20,655	19,548	19,392
Refined do	23,336	22,621	21,778	21,341	21,177

[e] Estimated. [p] Preliminary.

[1] Incorporates numerous revisions from the table corresponding to this table in previous editions of this chapter. Figures generally conform to those published in appropriate commodity chapters of volume I of the Minerals Yearbook, 1983 edition.

[2] Includes bauxite equivalent of nepheline syenite and alunite produced in the U.S.S.R. (the only producer on record of such materials as a source of aluminum).

[3] Excludes data for the United States (withheld to avoid disclosing company proprietary data).

[4] Excludes data for China (no adequate basis for estimation available).

[5] Excludes data for the U.S.S.R. (no adequate basis for estimation available).

[6] Includes all metal clearly identified as primary as well as all metal that cannot be subdivided clearly between primary and secondary (see footnote 7).

[7] Includes only that metal that is clearly identified as secondary. Some countries do not distinguish between primary and secondary, and for some of these, no basis is available for estimating the breakdown of total production. For such countries, the total has been included under primary (see footnote 6).

[8] Excludes data for the United States (withheld to avoid disclosing company proprietary data), which in previous years accounted for approximately 50% of the world total.

[9] Includes leucoxene.

[10] Comprises sulfur produced by the Frasch process plus sulfur mined in the elemental state from ores.

[11] Comprises sulfur recovered from coal gasification, metallurgical operations (except pyrite processing), natural gas, petroleum, tar sands, spent oxides, and gypsum, whether recovered in the elemental state or as a sulfur compound.

[12] Production of coke other than metallurgical by China and the U.S.S.R. is included with "Coke: Metallurgical" production.

VALUE OF WORLD MINERAL PRODUCTION

The value of world crude mineral output in 1983 was estimated at $519.7 billion constant 1978 dollars. Details on the methodology employed to prepare this estimate are summarized in the 1980 edition of this chapter, to which the reader is referred.

GEOGRAPHIC DISTRIBUTION OF WORLD MINERAL OUTPUT VALUE

Available information is inadequate to extrapolate to 1983 the 1978 data on geographic distribution of world crude mineral output published in the November-December 1980 edition of Annales des Mines. A summary of the 1978 distribution, together with comparable figures for 1973 and 1950 and additional textual comments on regional distribution of these values, was included in the 1980 edition of this chapter, and the reader is referred to this publication as well as to the original source for further detail.

COMMODITY DISTRIBUTION OF WORLD MINERAL OUTPUT VALUE

As in the case of geographic distribution of world crude mineral output value, the inadequacy of data precludes any reliable extrapolation of the various commodities' shares of the totals shown in the preceding edition of this chapter and in the source publication, Annales des Mines. The reader should refer to these publications for the data for 1978 and prior years.

TRADE

For 1982, the aggregate value of total world international trade in mineral commodities was estimated at $689,900 million (current dollars), 10.1% below the 1981 level and 13.3% below the record high set in 1980. Comparable data for 1983 were not available in time for inclusion in this chapter, but available partial information suggests that the 1983 level probably differed very little from that recorded for 1982. The following tabulation summarizes the development pattern in mineral commodity trade for 1978-82, inclusive, as well as the share of that trade in total commodity trade:

Year	Estimated value of all mineral commodities traded (millions)	Change from previous year (percent)	Mineral commodities' share of all commodities traded (percent)
1978	$407,500	+5.2	31.4
1979	581,200	+42.6	35.5
1980	r795,900	r+36.9	39.9
1981r	767,700	-3.5	39.0
1982	689,900	-10.1	37.6

rRevised.

Table 2, which serves as the basis for the estimates of total mineral commodity trade that appear in the foregoing tabulation, provides reported data on the value of trade in major mineral commodity groups and total commodity trade for 1978-82. Major mineral commodity trade by region (such as tables 8-10 in the 1976 edition of this chapter provide) may be obtained for more recent years directly from the United Nations Monthly Bulletin of Statistics for May 1984.

CONSUMPTION

NONFUEL MINERAL COMMODITIES

Consumption of the majority of nonfuel mineral commodities for which worldwide data are compiled increased in 1983, in sharp contrast to the pattern of 1982, when virtually all of these commodities registered declines. Of the 14 nonfuel commodities included in table 5, 9 showed higher consumption levels in 1983 than in 1982, including iron ore, aluminum, cadmium, copper, magnesium, nickel, zinc, nitrogenous fertilizers, and sulfur; while 5 showed drops—ferrous scrap, lead, tin, phosphatic fertilizers, and potassic fertilizers.

The style of presentation of nonferrous metal consumption data adopted in the 1982 edition of this chapter, which is separating data for market economy countries from that of centrally planned economy countries, has been preserved in this edition for the reasons outlined in the previous edition. First, it demonstrates the differences in pattern of consumption levels between these two distinct groups of countries. Second, and perhaps more importantly, there are substantial differences between production estimates for the centrally planned economy countries made by the Bureau of Mines and by the source publication for these consumption figures. Inasmuch as these production figures are used to calculate consumption, a considerable difference will result in computing consumption if different production figures are used. In centrally planned economy countries, the average differences in consumption that would result if Bureau of Mines production figures were substituted would be as follows: aluminum—lower by 600,000 tons per year; copper—lower by 440,000 tons per year; lead—lower by 150,000 tons per year; nickel—higher by 11,000 tons per year; tin—higher by 19,000 tons per year; and zinc—lower by 200,000 tons per year. There would be no significant changes in cadmium or magnesium.

MINERAL FUEL COMMODITIES

Table 5 also includes data on mineral fuel consumption, with use of each fuel expressed in terms of standard coal equivalent in order to make interfuel comparisons possible, as well as to permit display of an aggregate for all forms of energy. The declining trend in petroleum use that has prevailed since 1978 continued in 1983, but gains registered for other fuels more than compensated for the reduction in oil use in 1983, and total energy use increased for the first time since 1979. This gain was sufficient to raise the 1983 energy consumption level above not only that of 1982, but also that of 1981, although it remained 2% below the record high of 1979.

INVESTMENT

Comprehensive world mineral industry investment data do not exist, but available figures generally point to a small increase in the rate of investment. Data published by the U.S. Department of Commerce germane to U.S. foreign investment in 1983 showed a modest increase in capital outlays, relative to those of 1982.

Available reports on steel industry investment by the Organization for Economic Cooperation and Development shows a slight upturn between 1981 and 1982.

Updated information related to capital expenditures and exploration expenditures for the petroleum industry of market economies in 1981 and 1982 are not yet available. For data covering the period 1976-80, the reader is referred to tables 6 and 7 of the 1981 Minerals Yearbook.

TRANSPORTATION

MARINE TRANSPORT

Bulk carriers, freighters, and tankers are the three classes of vessels engaged in transporting mineral commodities. It should be noted that vessels in each of the three categories are not devoted wholly to mineral commodity transport. Bulk carriers move agricultural products as well as crude minerals and mineral fertilizers, while freighters, because of their great variety, can be devoted wholly to hauling mineral products or wholly to moving nonmineral goods, as well as carrying mixed mineral and nonmineral cargoes. Tankers, although largely engaged in moving crude oil and refinery products, also transport liquid chemicals, wine, molasses, and whale oil.

Although physical characteristics of vessels—size, draft, age, crew requirements, type of propulsion system, etc.—as well as fuel costs have an undeniable influence on shipping industry performance, problems of and changes in the quantity and type of material moved also significantly affect the shipping sector of the world economy. Unfortunately, data in this regard were not available at the time of this writing.

Bulk Carriers.—In 1983, the world's bulk carrier fleet increased by 169 vessels, compared with vessel increases of 189 and 228, in 1981 and 1982, respectively. The 1983 growth represented a 3.2% gain on the basis of the number of vessels. There was a very small increase in the average gross tonnage and deadweight tonnage of such vessels for a third year. The following tabulation shows the distribution of the world's bulk carrier fleet for 1983:

Country	Number of vessels	Deadweight tonnage (thousand tons)
Liberia	810	42,797
Greece	920	30,596
Japan	490	23,247
Panama	730	22,526
Norway	135	9,332
United Kingdom	138	7,233
Italy	123	6,490
Korea, Republic of	170	6,348
India	118	4,938
China	138	4,570
U.S.S.R	192	4,106
Brazil	76	4,004
Singapore	85	3,525
France	49	2,988
Taiwan	51	2,835
Belgium	32	2,351
Philippines	70	2,289
Spain	75	2,245
Poland	82	2,019
Romania	54	1,841
Germany, Federal Republic of	30	1,741
Australia	34	1,714
Cyprus	63	1,611
Turkey	47	1,605
Yugoslavia	52	1,593
Other	620	21,925
Total	5,384	216,469

Freighters.—The world's freighter fleet decreased by 12 vessels, compared with a 79-vessel increase in 1982 and a 41-vessel decrease in 1981. In the period 1981-83, total gross tonnage and deadweight tonnage posted an average increase of 1.1%. The following tabulation shows the distribution of the world's freighter fleet by country of registry for 1983:

Country	Number of vessels	Deadweight tonnage (thousand tons)
Panama	2,100	17,566
Greece	1,110	11,709
U.S.S.R	1,804	11,380
Japan	692	6,660
United States	437	6,591
China	599	6,036
Liberia	449	5,261
Singapore	364	3,624
Germany, Federal Republic of	314	3,173
United Kingdom	250	3,010
India	208	2,617
Cyprus	356	2,281
Netherlands	350	2,267
France	161	1,953
Yugoslavia	197	1,949
Korea, Republic of	256	1,895
Denmark	162	1,889
Poland	209	1,746
Brazil	192	1,676
Other	4,058	32,369
Total	14,268	125,652

Tankers.—In 1983, the world's tanker fleet was 25 vessels less than in 1982, but 91 vessels greater than in 1981. Total gross tonnage fell by 2.4% between 1981 and 1982 and by 3.7% between 1982 and 1983. The following tabulation distributes the world's tanker fleet by country of registry for 1983:

Country	Number of vessels	Deadweight tonnage (thousand tons)
Liberia	752	83,427
Japan	525	31,271
Greece	381	26,169
Norway	248	21,737
Panama	430	17,498
United Kingdom	287	16,948
United States	289	16,508
France	99	11,578
U.S.S.R	455	7,564
Spain	112	6,936
Italy	231	6,816
Saudi Arabia	77	5,874
Denmark	79	4,785
Singapore	103	4,473
Cyprus	58	4,209
Germany, Federal Republic of	88	3,925
Netherlands	65	3,494
Brazil	72	3,303
Other	1,257	46,106
Total	5,608	322,621

Considering the world's tanker fleet as a whole, there have been some modest changes in the share of the total accounted for by vessels of different size groups over the 5 years, 1979-83, as shown in the following tabulation, based on data published on page 18 in the British Petroleum Co. Ltd. annual publication, BP Statistical Review of the World Oil Industry, June 1984:

Size group (deadweight tons)	Percent of total				
	1979	1980	1981	1982	1983
10,000-25,000	4.3	4.3	4.3	4.4	4.6
25,000-45,000	7.4	7.6	8.1	9.0	9.7
45,000-65,000	4.7	4.9	5.2	5.3	5.4
65,000-125,000	15.6	16.2	17.3	17.1	17.1
125,000-205,000	10.2	10.2	9.7	9.9	10.2
205,000-285,000	43.4	42.8	41.0	39.0	36.8
285,000 and over	14.4	14.0	14.4	15.3	16.2

OCEAN FREIGHT RATES

On balance, 1983 ocean freight rates fell slightly from their 1982 levels. Available information suggests that slackened demand for the commonly used, handy sized tankers of under 30,000-deadweight-ton capacity accounted for the net decline in tanker rates. Dry cargo rates, as a whole, also slipped, and increased demand for bulk carriers with capacities of 20,000 to 34,999 deadweight tons and 85,000 deadweight tons and over was not sufficient to offset the reduction in charters on other types of bulk carriers. Specific indices of 1983 ocean freight rates are available in the June 1984 edition of the United Nations Monthly Bulletin of Statistics.

PANAMA AND SUEZ CANALS

The Panama Canal reported overall increases in activity during the fiscal years ending September 30, 1981, and September 30, 1982. The general traffic condition of the canal, both in terms of the number of vessels transiting the canal and in terms of cargo moved, is indicated in the following table:

	Fiscal year[1]				
	1978	1979	1980	1981	1982
Number of transits:					
Commercial ocean traffic	12,677	12,935	13,507	13,884	14,009
Other traffic	1,131	1,427	1,218	1,166	1,262
Total	13,808	14,362	14,725	15,050	15,271
Cargo moved (thousand metric tons):					
Commercial ocean traffic:					
Mineral commodities	83,614	90,082	99,520	99,969	111,493
Other commodities	61,191	66,503	70,379	74,001	76,936
Subtotal	144,805	156,585	169,899	173,970	188,429
Other traffic	304	370	403	308	291
Total	145,109	156,955	170,302	174,278	188,720

[1] Year ending Sept. 30 of that stated.

In fiscal year 1982, mineral commodities accounted for 59.1% of all commercial traffic through the Panama Canal, 1.7% greater than in 1981 and 0.7% greater than in 1980.

Table 9 distributes mineral commodity trade through the canal during 1980-82 by major group.

In terms of the major mineral commodity groups, fuels were dominant in each year, 1980-82, increasing their share of total tonnage from 65.9% in 1980 to 74.4% in 1982. Metals ranked second, with steel semimanufactures as the dominant single commodity element; among the nonmetallics, fertilizer materials were overwhelmingly dominant.

For greater detail on mineral movements through the Panama Canal, see the Panama Canal Co. Annual Report series.

The Suez Canal reported overall increases in activity during 1983. The general traffic condition of the canal, both in terms of the number of vessels transiting the canal and in terms of cargo moved, is indicated in the following table:

	1981	1982	1983
Number of transits:			
Commercial ocean traffic	20,395	21,398	21,026
Other traffic	1,182	1,147	1,198
Total	21,577	22,545	22,224
Cargo moved (thousand metric tons):			
Commercial ocean traffic:			
Mineral commodities	104,309	136,267	153,497
Other commodities	92,119	95,126	103,208
Total	196,428	231,393	256,705

In 1983, mineral commodities accounted for 59.8% of all commercial traffic through the Suez Canal, an increase of 0.9% over that of 1982.

Table 10 distributes mineral commodity trade through the canal during 1981-83 by major group.

As in the case of the Panama Canal, fuels held the dominant share of tonnage among commodity groups moved on the Suez Canal, 40.2% in 1983, up from 38.1% in 1982. Metals ranked second, with iron ore outweighing other commodities within this category; among the nonmetallics, fertilizer materials were preponderant in 1982 and 1983.

Further information on movements on the Suez Canal can be found in the Suez Canal Report series.

PIPELINES

Limitations of time and space preclude comprehensive assessment of international pipeline activities. Major projects in individual countries are treated in the various country chapters.

PRICES

Comprehensive data on world prices for crude minerals and for mineral products are not available, but even if such data were available, they would be of little actual use. Tables 11, 12, and 13 summarize prices for selected metals in the United States, the United Kingdom, and Canada, respectively, for 1979-83 inclusive, with monthly data provided for 1983. A cursory examination of these tables clearly shows a general upturn in the prices for most of these metals between 1982 and 1983; only lead showed a downturn, and this prevailed in all three markets, while only nickel and cobalt showed no price alteration between 1982 and 1983. It is noteworthy, however, that prices such as these expressed here, all in current dollars, fail to tell the complete story of metal pricing. Only by adjusting data to a constant dollar basis is the full picture evident. For example, aluminum, with a U.S. average price of 77.667 cents per pound in 1983 had registered an increase of nearly 211% over its 1967 average price of 24.978 cents per pound. However, adjusting the 1983 price to constant 1967 dollars, the average price was only 26.018 cents per pound, a real increase of only 4.2%. The aluminum price at least registered some gain over this 16-year period. In the case of lead, with a 21.677 cents per pound current dollar average price in 1983, compared with a 14.000 cents per pound current dollar price in 1967, application of the appropriate deflator factor gives a 1983 price of only 7.262 cents per pound in 1983 in terms of 1967 dollars, a decline of 48% in terms of constant dollars. Similarly, in terms of constant dollars, the value of a pound of zinc on the U.S. market advanced by less than 0.2% between 1967 and 1983, while copper recorded a 31.8% drop in constant dollar value.

Thus, although price increases in terms of current dollars were registered for most of the metals listed in table 11 for the U.S. market, only copper, zinc, and silver recorded price increases that more than compensated for even the low inflation rate between 1982 and 1983 (4.1%); all others recorded declines in terms of constant dollars.

Comparison of crude oil prices between yearend 1982 and yearend 1983 shows that for Persian Gulf crude oils, prices per barrel f.o.b. declined from a range of US$29.30 to US$34.56 in December 1982 to a range of US$27.10 to US$24.56 at yearend. Many of the individual prices were dropped on March 1, 1983, although the US$27.10 level for Iranian medium-heavy was set in August. African crude oil prices, US$34.52 to US$35.52 at the start of 1982, had fallen to US$29.02 to US$30.50 by yearend. North Sea crudes, US$33.50 to US$34.25 in January, were down to US$30.00 to US$30.25 by December. Indonesian light (35° API) prices were reduced from US$34.53 to US$29.53 in February and remained at that level through yearend, and Chinese (Daqing—33° API) crude also fell from US$34.90 to US$28.70 in February, maintaining the latter price through yearend. In the Western Hemisphere, Venezuelan crude oils that ranged from US$32.03 to US$37.06 at the start of the year were reduced to US$27.03 to US$31.09 in March, holding at that level through yearend, and Mexican Isthmus crude prices were lowered from the US$32.50 rate that was in effect in January to US$29.00 in February, with that price prevailing through yearend. Only the heavy Mexican Maya crude maintained a constant price at US$25.00 across the year. The Canadian wellhead price for conventional "old" oil was advanced 15.5% in terms of Canadian dollars on January 1, 1983, and remained at that level through yearend. However, because of the relatively higher inflation rate in Canada during 1983, the U.S. dollar value of a barrel of Canadian crude oil fell from US$24.20 on January 1 to US$23.91 on December 31. In the United States, the listed price for sweet crude fell from US$32.25 to US$30.35, while that for sour crude declined from US$31.00 to US$29.00.

STATISTICAL SUMMARY OF WORLD PRODUCTION AND TRADE OF MAJOR MINERAL COMMODITIES

The final 24 tables of this chapter, tables 14-37, extend the statistical series on production that was started in the 1963 edition of the International Area Reports volume of the Minerals Yearbook and was subsequently updated and expanded in the 1965 and 1976-82 editions. They are primarily a supplement to other statistical data within this chapter but also serve as a summary of international production data for major mineral commodities covered in greater detail, on a commodity basis, in volume I of the 1983 Minerals Yearbook and on a country basis in volume III.

In this edition, the data presented in these tables, in most instances, correspond with the data in the individual commodity world production tables appearing in volume I and may differ somewhat from a total that might be obtained by adding figures presented for any single commodity in each of the country chapters of volume III. This apparent disparity results from problems of scheduling compilation of tables in the numerous commodity and country chapters in the two volumes. In an effort to provide the user with the most up-to-date information possible, data received after completion of worldwide commodity production tables (volume I) have been included in many of the individual country production tables (volume III). Limitations of time, however, have prevented the incorporation of these revisions in the abbreviated versions of the world commodity tables included here. Thus, a more precise figure for total world production of any commodity could be obtained by adding figures presented in the individual country chapters. For summary purposes, however, it is felt that tables 14-37 of this chapter are sufficiently correct without the inclusion of these generally minor revisions.

The series of data on world trade in major mineral commodities that has appeared in most previous editions of this chapter (tables 57-69 in the 1976 edition) could not be included owing to scheduling problems.

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[1] Senior foreign mineral specialist, Division of Foreign Data.

[2] Foreign mineral specialist, Division of Foreign Data.

[3] Table 1 contains 98 data lines, but 3 of these are totals of others; these total lines are not included in the total of 95 distinct commodities or forms of commodities counted here.

Table 2.—Value of world export trade in major mineral commodity groups[1]

(Million U.S. dollars)

Commodity group	1978	1979	1980[r]	1981[r]	1982
Metals:					
All ores, concentrates, scrap	16,525	23,559	29,401	26,511	21,419
Iron and steel	57,123	70,399	75,695	73,301	69,213
Nonferrous metals	27,753	37,129	52,437	37,967	33,300
Total	101,401	131,087	157,533	137,779	123,932
Nonmetals, crude only	7,796	9,598	11,678	11,443	9,553
Mineral fuels	222,887	333,031	479,545	476,456	428,750
Grand total	332,084	473,716	648,756	625,678	562,235
All commodities	1,298,121	[r]1,636,398	1,994,185	1,963,898	1,836,647

[r] Revised.

[1] Data presented are for selected major commodity groups of the Standard International Trade Classification Revised (SITCR) and as such exclude some mineral commodities classified in that data array together with other (nonmineral) commodities. SITCR categories included are as follows: All ores, concentrates, and scrap—SITC Div. 28; iron and steel—SITC Div. 67; nonferrous metals—SITC Div. 68; nonmetals (crude only)—SITC Div. 27; and mineral fuels—SITC Div. 3. Major items not included are the metals, metalloids, and metal oxides of SITC Group 513; mineral tar and other coal, petroleum, and gas-derived crude chemicals of SITC Div. 52; manufactured fertilizers of SITC Div. 56; and nonmetallic mineral manufactures of SITC Groups 661, 662, 663, and 667. Data include special category exports, ship stores and bunkers, and other exports of minor importance, and exclude the intertrade of the centrally planned economy countries of Asia and trade between the Federal Republic of Germany and the German Democratic Republic.

Source: United Nations. Monthly Bulletin of Statistics. V. 38, No. 5, May 1984, p. cxxiii.

Table 3.—Distribution of value of world export trade in major mineral commodity groups[1]

(Percent)

Commodity group	1978	1979	1980	1981	1982
Metals:					
All ores, concentrates, scrap	5.0	5.0	4.5	[r]4.2	3.8
Iron and steel	17.2	14.9	11.7	11.7	12.3
Nonferrous metals	8.4	7.8	8.1	6.1	5.9
Total	30.6	27.7	24.3	[r]22.0	22.0
Nonmetals, crude only	2.3	2.0	1.8	1.8	1.7
Mineral fuels	67.1	70.3	73.9	[r]76.2	76.3

[r] Revised.

[1] For detailed definition of groups, see footnote 1, table 2.

Table 4.—Growth of value of world export trade in major mineral commodity groups[1]

(Percent change from that of previous year)

Commodity group	1978	1979	1980	1981	1982
Metals:					
All ores, concentrates, scrap	+5.5	+42.6	[r]+24.8	[r]-9.8	-19.2
Iron and steel	+22.3	+23.2	[r]+7.5	[r]-3.2	-5.6
Nonferrous metals	+14.5	+33.8	[r]+41.2	[r]-27.6	-12.3
All metals	+17.1	+29.3	[r]+20.2	-12.5	-10.1
Nonmetals, crude only	+11.2	+23.1	[r]+21.7	[r]-2.0	-16.5
Mineral fuels	+.3	+49.4	[r]+44.0	[r]-.6	-10.0
All major mineral commodity groups	+5.2	+42.6	[r]+36.9	[r]-3.6	-10.1
All commodities	+15.4	+26.1	+21.9	[r]-1.5	-6.5

[r] Revised.

[1] For detailed definition of groups, see footnote 1, table 2.

Table 5.—World consumption of selected mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983[p]
Ferrous metals: World:					
Iron ore, gross weight[e] million metric tons	912	883	862	776	785
Iron and steel scrap, gross weight[e] do	[r]334	[r]341	[r]326	317	284
Nonferrous metals:					
Market economy countries:					
Aluminum, refined	[r]12,601	[r]11,996	[r]11,221	10,841	11,928
Cadmium	15	13	[r]12	12	14
Copper, refined	[r]7,513	[r]7,088	[r]7,229	6,746	6,769
Lead, refined	[r]4,190	[r]3,882	[r]3,802	3,778	3,754
Magnesium, primary	213	[r]204	[r]179	166	188
Nickel[1]	[r]560	[r]526	[r]475	460	490
Tin, refined	179	[r]181	[r]172	160	160
Zinc, slab	[r]4,633	[r]4,403	[r]4,276	4,148	4,324
Centrally planned economy countries:					
Aluminum, primary, refined	3,374	[r]3,307	[r]3,336	3,370	3,374
Cadmium	4	4	[r]4	4	4
Copper, refined	[r]2,307	[r]2,273	[r]2,266	2,207	2,322
Lead, refined	1,438	1,466	[r]1,461	1,472	1,465
Magnesium, primary	[r]76	80	82	82	87
Nickel[2]	190	189	[r]186	192	193
Tin, refined	54	[r]54	[r]54	56	55
Zinc, slab	1,691	[r]1,721	[r]1,719	1,766	1,795
World total:					
Aluminum, refined	[r]15,975	[r]15,303	[r]14,557	14,211	15,302
Cadmium	19	17	16	16	18
Copper, refined	[r]9,820	[r]9,361	[r]9,495	8,953	9,091
Lead, refined	[r]5,628	[r]5,348	[r]5,263	5,250	5,219
Magnesium, primary	[r]289	[r]284	[r]261	248	275
Nickel[2]	[r]750	[r]715	[r]661	652	683
Tin, refined	233	[r]235	[r]226	216	215
Zinc, slab	[r]6,324	[r]6,124	[r]5,995	5,914	6,119
Nonmetals: World:					
Fertilizers:					
Nitrogenous[3] million metric tons of contained N	53,526	57,433	[r]60,551	60,521	61,033
Phosphatic[3] million metric tons of contained P_2O_5	29,731	31,171	[r]31,572	30,841	30,381
Potassic[3] million metric tons of K_2O equivalent	24,410	24,039	[r]24,325	23,680	22,639
Sulfur million metric tons of elemental sulfur equivalent	54,894	[r]55,943	[r]54,668	50,951	53,500
Mineral fuels:					
Solid fuels million metric tons of standard coal equivalent	2,581	[r]2,624	[r]2,642	2,693	2,759
Liquid fuels do	3,947	[r]3,767	[r]3,629	3,543	3,504
Natural gas do	1,837	[r]1,831	[r]1,830	1,836	1,853
Hydro, geothermal and nuclear electricity do	288	[r]301	320	334	352
Total do	8,653	[r]8,523	[r]8,421	[4]8,405	8,468

[e]Estimated. [p]Preliminary. [r]Revised.

[1] Primary and secondary combined.

[2] Nickel content of refined nickel, ferronickel, and nickel oxide.

[3] Data are for years ending June 30 of that stated.

[4] Data do not add to total shown because of independent rounding.

Sources: Based on data provided by the World Bureau of Metal Statistics (market economy countries, nonferrous metals except magnesium); Metallgesellschaft AG (centrally planned economy countries, nonferrous metals and all magnesium consumption); British Sulphur Corp. (nonmetals); United Nations Yearbook of World Energy Statistics (all mineral fuels for 1979); 1982 United Nations Energy Statistics Yearbook (all mineral fuels for 1980-82); and British Petroleum Co., p. 1c (mineral fuels data for 1983). Data on iron ore and iron and steel scrap compiled from a variety of sources by the U.S. Bureau of Mines.

Table 6.—Annual investment expenditure in the steel industry for selected countries

(Million dollars unless otherwise specified)

Country or country group	1978	1979	1980	1981	1982
EEC[1]	2,022	2,098	2,375	[r]2,538	2,604
EFTA[2]	364	509	840	[r]537	247
Other countries:					
Australia	132	122	220	355	217
Canada	309	319	487	[r]698	491
Japan	4,338	2,916	2,865	[r]3,610	3,830
New Zealand	NA	6	NA	NA	NA
Spain	309	294	237	183	210
Turkey	387	NA	NA	NA	NA
United States	2,595	3,367	3,400	[r]3,365	4,219
Total[3]	10,456	9,631	10,424	[r]11,286	11,818

[r] Revised. NA Not available.

[1] Source reports that values for European Economic Community (EEC) countries are in terms of "million units of account." For the Federal Republic of Germany (included in EEC in this tabulation), the source indicates that for 1976, 823.1 million units of account was equivalent to $885.3 million (no conversion rate given for other countries for 1976 and no conversion rate given for any country for 1977-80, and no further explanation is offered).

[2] European Free Trade Association (EFTA) figures exclude data for Switzerland.

[3] Figures have been totaled as if EEC data were in U.S. dollars, in keeping with totals appearing in a graph in source publication (see footnote 1).

Sources: Organization for Economic Cooperation and Development. The Iron and Steel Industry in 1978. Paris, 1980, p. 25; The Iron and Steel Industry in 1979. Paris, 1981, p. 22; The Iron and Steel Industry in 1980. Paris, 1982, p. 25; The Iron and Steel Industry in 1981. Paris, 1983, p. 32; The Iron and Steel Industry in 1982. Paris, 1984, p. 32.

Table 7.—Salient statistics on U.S. foreign investment in mineral industry activities

(Million dollars)

	1981	1982[r]	1983
Direct foreign investment:			
Mining, smelting, refining	7,217	6,292	6,742
Petroleum	51,223	56,642	59,785
Reinvested earnings of foreign affiliates:			
Mining, smelting, refining	[1]118	-207	-80
Petroleum	[1]4,160	1,141	2,155
Equity and intercompany account flows:			
Mining, smelting, refining	[1]217	W	537
Petroleum	[1]-1,117	3,003	564
Income:			
Mining, smelting, refining	802	163	211
Petroleum	13,292	10,059	9,172

[r] Revised. W Withheld to avoid disclosing company proprietary data.

[1] Reinvested earnings are those of incorporated affiliates only.

Sources: U.S. Department of Commerce. U.S. Direct Investment Abroad, Aug. 15, 1984.

Table 8.—World merchant fleet distribution, by type[1]

Type	1978	1979	1980	1981	1982	1983
Number of vessels:						
Bulk carriers	4,651	4,714	4,798	4,987	5,215	5,384
Freighters[2]	14,141	14,329	14,242	14,201	14,280	14,268
Tankers	5,233	5,260	5,359	5,517	5,583	5,608
Other[3]	487	495	468	405	404	379
Total	24,512	24,798	24,867	25,110	25,482	25,639
Gross tonnage:						
Bulk carriers thousand metric tons	104,291	105,341	106,927	111,820	119,341	124,000
Freighters[2] do	87,700	89,643	90,674	92,142	93,323	94,222
Tankers do	182,367	183,130	183,858	184,551	180,082	173,335
Other[3] do	4,551	4,535	4,252	3,867	3,898	3,768
Total do	378,909	382,649	385,711	392,380	396,644	395,325
Deadweight tonnage:						
Bulk carriers do	180,436	182,319	185,311	194,368	208,153	216,469
Freighters[2] do	117,953	120,494	121,252	123,119	124,994	125,652
Tankers do	344,780	345,880	346,329	346,439	336,142	322,621
Other[3] do	2,319	2,209	2,017	1,827	1,805	1,673
Total do	645,488	650,902	654,909	665,753	671,094	666,415

[1] Maritime Administration classification. Tankers include whaling tankers. Vessels shown here as "Other" include combination passenger and cargo and combination passenger and refrigerated cargo. Data are as of Dec. 31 of year indicated.

[2] Includes refrigerated freighters.

[3] Excludes refrigerated freighters.

Source: U.S. Department of Transportation, Maritime Administration. Merchant Fleets of the World. Annual issue for 1982 and unpublished data supplied by the same agency for 1983.

Table 9.—Movement of mineral commodities through the Panama Canal

(Thousand metric tons)

	1980			1981			1982		
	Atlantic to Pacific	Pacific to Atlantic	Total	Atlantic to Pacific	Pacific to Atlantic	Total	Atlantic to Pacific	Pacific to Atlantic	Total
METALS									
Ore and concentrate:									
Bauxite and alumina	509	735	[r]1,244	572	541	1,113	372	183	555
Chromite	6	101	107	3	114	117	4	51	55
Copper	20	614	634	49	607	656	29	742	771
Iron	44	1,704	1,748	8	430	438	24	266	290
Lead	28	108	136	19	112	131	36	151	187
Manganese	383	242	625	256	103	359	187	69	256
Tin	1	49	50	--	50	50	--	44	44
Zinc	71	593	664	64	403	467	38	564	602
Other and unspecified	83	1,930	2,013	148	1,998	2,146	64	2,133	2,197
Subtotal	1,145	6,076	[r]7,221	1,119	4,358	5,477	754	4,203	4,957
Ingots and semimanufactures:									
Aluminum	240	88	328	297	62	359	317	65	382
Copper	17	986	1,003	8	967	975	4	959	963
Iron and steel[1] [2]	4,335	5,838	10,173	3,603	5,035	8,638	2,953	5,366	8,319
Lead	4	74	78	4	63	67	18	98	116
Tin[1]	50	44	94	62	44	106	33	29	62
Zinc	6	137	143	34	141	175	6	212	218
Other	84	137	221	32	170	202	43	96	139
Subtotal	4,736	7,304	12,040	4,040	6,482	10,522	3,374	6,825	10,199
Total	5,881	13,380	19,261	5,159	10,840	15,999	4,128	11,028	15,156
NONMETALS									
Borax	3	463	466	4	546	550	2	433	435
Cement	176	1	177	224	10	234	61	7	68
Clays, fire and china	401	15	416	365	11	376	452	9	461
Fertilizer materials	8,148	1,805	9,953	7,397	1,290	8,687	7,013	1,578	8,591
Salt	102	611	713	87	299	386	120	594	714
Sulfur	109	2,271	2,380	44	2,388	2,432	2	2,616	2,618
Other[3]	267	245	[r]512	242	239	481	195	276	471
Total	9,206	5,411	14,617	8,363	4,783	13,146	7,845	5,513	13,358
MINERAL FUELS									
Carbon: Carbon black	76	106	182	34	30	64	6	106	112
Coal and coke	14,948	2,333	17,281	18,827	1,707	20,534	21,590	1,301	22,891
Petroleum:									
Crude	5,371	30,540	35,911	5,237	31,760	36,997	4,481	40,762	45,243
Refined	6,828	5,440	12,268	6,371	6,858	13,229	9,438	5,295	14,733
Subtotal	12,199	35,980	48,179	11,608	38,618	50,226	13,919	46,057	59,976
Total	27,223	38,419	65,642	30,469	40,355	70,824	35,515	47,464	82,979
Grand total	42,310	57,210	99,520	43,991	55,978	99,969	47,488	64,005	111,493

[r] Revised.

[1] Tinplate is included under "Tin" rather than under "Iron and steel" in source publication.

[2] Includes a category identified simply as "Scrap" in source publication, which may include scrap other than iron and steel scrap.

[3] Comprises asbestos, diatomite, soda and other sodium compounds, brick and tile, marble and other stone, slag, clinkers, and dross.

Source: Panama Canal Commission Annual Report 1981 and 1982.

Table 10.—Movement of mineral commodities through the Suez Canal

(Thousand metric tons)

	1981			1982			1983		
	North-bound	South-bound	Total	North-bound	South-bound	Total	North-bound	South-bound	Total
METALS									
Aluminum ore (bauxite)	2,263	(1)	2,263	2,120	(1)	2,120	1,352	(1)	1,352
Antimony	48	(1)	48	13	(1)	13	118	(1)	118
Chromium ore, concentrate, metal	121	(1)	121	160	(1)	160	61	(1)	61
Copper ore, concentrate, metal	201	(1)	201	131	(1)	131	201	(1)	201
Iron and steel:									
Iron ore	4,996	(1)	4,996	6,262	(1)	6,262	5,319	(1)	5,319
Scrap	35	NA	35	2	NA	2	7	NA	7
Pig iron	(2)	739	739	(1)	625	625	(2)	1,087	1,087
Unwrought	(2)	2,158	2,158	(2)	1,739	1,739	(2)	3,404	3,404
Plates and sheets	(2)	1,311	1,311	(2)	972	972	(2)	1,359	1,359
Lead ore, concentrate, metal	131	(1)	131	247	(1)	247	121	(1)	121
Manganese ore, concentrate, metal	387	(1)	387	630	(1)	630	544	(1)	544
Tin ore, concentrate, metal	36	(1)	36	16	(1)	16	28	(1)	28
Titanium ore (ilmenite and rutile)	407	(1)	407	265	(1)	265	447	(1)	447
Tungsten[3]	--	(1)	(1)	13	(1)	13	12	(1)	12
Zinc ore, concentrate, metal	219	(1)	219	205	(1)	205	149	(1)	149
Other and unspecified:									
Ores	1,568	735	2,303	1,321	1,068	2,389	792	788	1,580
Metals	1,817	3,116	4,933	2,804	2,723	5,527	1,922	4,563	6,485
NONMETALS									
Cement	NA	12,569	12,569	--	12,107	12,107	38	13,180	13,218
Fertilizer materials:									
Nitrogenous:									
Urea	(4)	3,452	3,452	(4)	3,149	3,149	(4)	3,093	3,093
Ammonium nitrate	(4)	333	333	(4)	324	324	(4)	305	305
Ammonium sulfate	(4)	301	301	(4)	305	305	(4)	359	359
Phosphatic	(4)	2,881	2,881	(4)	2,894	2,894	(4)	2,812	2,812
Potassic	(4)	1,438	1,438	(4)	1,492	1,492	(4)	1,447	1,447
Other and unspecified	201	2,608	2,809	1,911	3,411	5,322	2,223	3,531	5,754
Total	201	11,013	11,214	1,911	11,575	13,486	2,223	11,547	13,770
Salt	--	58	58	2	43	45	--	29	29
Minerals and rocks	395	643	1,038	663	462	1,125	588	1,002	1,590
MINERAL FUELS									
Coal and coke	3,678	333	4,011	3,996	446	4,442	4,251	399	4,650
Petroleum:									
Crude	25,624	4,269	29,893	49,074	6,353	55,427	63,753	2,831	66,584
Refinery products:									
Gasoline	523	1,237	1,760	249	1,020	1,269	184	1,156	1,340
Kerosine	80	2,288	2,368	275	2,443	2,718	278	3,313	3,591
Distillate fuel oil	927	8,251	9,178	1,003	7,373	8,376	1,784	5,323	7,107
Residual fuel oil	1,911	684	2,595	5,020	1,051	6,071	7,975	1,874	9,849
Lubricating oil	(5)	209	209	(5)	161	161	(5)	214	214
Asphalt	(5)	53	53	(5)	94	94	(5)	2	2
Petroleum residues	92	(5)	92	41	(5)	41	17	(5)	17
Other and unspecified	7,501	1,482	8,983	7,518	2,071	9,589	7,249	2,513	9,762
Total mineral commodities	53,161	51,148	104,309	83,941	52,326	136,267	99,413	[6]54,084	[6]153,497
All goods	93,896	102,532	196,428	124,805	106,588	231,393	141,002	115,703	256,705

NA Not available.

[1] Included under "Other and unspecified: Ores."

[2] Included under "Other and unspecified: Metals."

[3] Reported simply as "Tungsten," but believed to consist mainly of tungsten concentrates, with a small amount of metal included.

[4] Included under "Fertilizer materials: Other and unspecified."

[5] Included under "Petroleum: Other and unspecified."

[6] Total as reported in source publication, Suez Canal Authority Annual Report 1983.

Table 11. —Nonferrous metal prices in the United States

(Average cents per pound unless otherwise specified)

Year and month	Aluminum[1]	Copper[2]	Lead[3]	Zinc[4]	Tin[5]	Silver[6]	Nickel[7]	Cadmium[8]	Cobalt[9]
1979	59.395	[r]93.334	52.642	37.296	7.133	11.094	2.715	2.758	24.58
1980	[r]169.566	[r]102.416	42.456	37.428	7.734	20.632	3.415	2.843	25.00
1981	76.000	[r]85.119	36.531	44.555	6.554	10.519	3.429	1.870	([10])
1982	76.000	[r]74.309	25.542	38.473	5.869	7.947	3.200	1.113	12.50
1983:									
January	76.000	80.219	22.028	38.605	5.534	12.396	3.200	1.000	12.50
February	76.000	84.024	21.124	38.621	6.005	13.964	3.200	1.000	12.50
March	76.000	82.072	20.713	37.895	6.196	10.619	3.200	1.000	12.50
April	76.000	83.493	21.171	37.998	6.339	11.694	3.200	1.000	12.50
May	76.000	85.634	20.224	38.110	6.204	12.976	3.200	1.086	12.50
June	76.000	81.836	19.414	39.462	6.139	11.749	3.200	1.150	12.50
July	76.000	82.947	19.324	40.010	6.099	12.088	3.200	1.150	12.50
August	76.000	80.542	19.458	40.562	5.937	12.096	3.200	1.159	12.50
September	81.000	77.587	21.686	42.976	5.936	11.915	3.200	1.250	12.50
October	81.000	72.392	25.377	46.108	5.960	9.841	3.200	1.250	12.50
November	81.000	69.581	25.151	47.545	6.023	8.837	3.200	1.250	12.50
December	81.000	70.605	24.459	48.740	5.781	9.121	3.200	1.250	12.50
Average	77.667	79.261	21.677	41.386	6.013	11.441	3.200	1.129	12.50

[r] Revised.

[1] U.S. list price, North American producer.

[2] Electrolytic, f.o.b. refinery (not delivered, United States, as erroneously reported in 1981 edition).

[3] Refined lead, nationwide.

[4] Prime Western, f.o.b. East St. Louis.

[5] U.S. dollars per pound, New York dealer.

[6] U.S. dollars per troy ounce, 0.999 fine, New York.

[7] U.S. dollars per pound, major producer cathode.

[8] U.S. dollars per pound, producer.

[9] U.S. dollars per pound, shot-cathode, 250-kilogram lots.

[10] Price was $25 in Jan.-Feb. 1981; $20 in Mar.-Aug. 1981, inclusive; and suspended from Sept. 1981 through Jan. 1982, inclusive.

Source: American Bureau of Metal Statistics Inc.

Table 12.—Nonferrous metal prices in the United Kingdom[1]

(Average U.S. cents per pound unless otherwise specified)

Year and month	Aluminum[2]	Copper[3]	Gold[4]	Lead[5]	Silver[6]	Tin[7]	Zinc[8]
1979	72.724	90.113	306.686	54.520	11.110	7.027	33.588
1980	80.753	99.297	612.562	41.213	20.872	7.631	34.482
1981	57.274	79.488	459.715	33.296	10.524	6.500	38.932
1982	44.966	67.192	375.792	24.656	7.920	5.810	33.734
1983:							
January	48.888	71.300	481.288	21.544	12.421	5.481	31.684
February	55.842	74.724	491.113	20.608	13.976	5.914	30.880
March	59.010	72.466	419.696	20.088	10.648	6.095	30.745
April	61.622	75.974	432.882	20.737	11.728	6.256	31.611
May	65.847	80.092	438.008	19.630	12.956	6.135	33.335
June	66.368	77.167	412.841	18.493	11.779	6.058	32.561
July	68.882	77.305	422.717	18.274	12.052	5.985	33.543
August	72.753	74.380	416.236	18.038	12.059	5.822	36.666
September	73.185	70.791	411.802	18.344	11.956	5.790	37.982
October	71.009	65.099	393.579	19.001	9.885	5.877	38.933
November	68.737	63.008	381.659	18.344	8.810	5.875	38.970
December	70.226	64.194	388.344	18.225	9.179	5.637	38.847
Average	65.342	72.153	424.180	19.273	11.454	5.913	34.727

[1] London Metal Exchange average monthly settlement prices.
[2] Unalloyed ingot 99.5%.
[3] Electrolytic wirebars.
[4] U.S. dollars per troy ounce, final price.
[5] Refined lead.
[6] U.S. dollars per troy ounce, 0.999 fine.
[7] U.S. dollars per pound, Straits tin.
[8] Slab.

Source: American Bureau of Metal Statistics Inc.

Table 13.—Nonferrous metal prices in Canada

(Average U.S. cents per pound unless otherwise specified)

Year and month	Copper[1]	Lead[2]	Silver[3]	Zinc[4]
1979	92.884	51.133	11.086	36.888
1980	100.596	42.174	20.637	37.453
1981	83.973	37.183	10.528	44.778
1982	72.395	26.279	7.951	39.437
1983:				
January	77.745	22.422	12.471	39.880
February	81.086	21.402	13.966	39.607
March	77.593	20.998	10.622	37.919
April	80.345	20.893	11.694	38.033
May	82.884	20.125	12.987	39.863
June	79.084	19.476	11.752	39.763
July	80.155	19.516	12.119	40.899
August	74.830	19.364	12.123	43.485
September	74.408	21.635	11.918	45.432
October	68.507	25.974	9.845	46.429
November	66.489	26.886	8.836	48.516
December	68.109	24.461	9.157	48.119
Average	75.936	21.929	11.458	42.329

[1] For 1978-79, electrolytic wirebar, f.o.b. delivered basis, Canadian points; for 1980-82, domestic producer delivered price for cathode.
[2] Pig lead.
[3] U.S. dollars per troy ounce.
[4] Producers' prices, carload quantities, Cominco Ltd.

Source: American Bureau of Metal Statistics Inc.

Table 14.—Leading world producers of bauxite[1]

(Thousand metric tons, gross weight)

Country	1979	1980	1981	1982[p]	1983[e]
Australia	27,583	27,178	25,541	23,625	24,500
Guinea[e]	11,326	11,862	11,112	11,827	[2]11,080
Jamaica	11,618	12,054	11,682	8,361	7,300
Brazil	2,388	5,538	5,770	6,289	7,000
U.S.S.R.[e] [3]	6,180	6,180	6,180	6,180	6,180
Yugoslavia	3,012	3,138	3,249	3,668	[2]3,500
Hungary	2,976	2,950	2,914	2,627	2,917
Greece	2,812	3,286	3,216	2,853	2,900
India	1,952	1,785	1,923	1,854	[2]1,923
Guyana[e]	2,312	1,844	1,681	1,430	[2]1,791
Suriname	5,010	4,646	4,100	3,059	1,750
France	1,969	1,921	1,824	1,662	1,716
China[e]	1,500	1,500	1,500	1,500	1,500
Total	[r]80,638	[r]83,882	80,692	74,935	74,057
Other	[r]6,464	[r]6,913	6,411	4,438	3,539
Grand total	[r]87,102	[r]90,795	87,103	79,373	77,596

[e]Estimated. [p]Preliminary. [r]Revised.

[1] Table includes data available as of June 27, 1984.

[2] Reported figure.

[3] Includes bauxite equivalent of nepheline syenite concentrates and alunite ore (produced in the U.S.S.R. only).

Table 15.—Leading world producers of aluminum[1]

(Thousand metric tons)

Country	1979	1980	1981	1982[p]	1983[e]
United States	4,557	4,654	4,489	3,274	3,353
U.S.S.R.[e]	1,750	1,760	1,800	1,875	2,000
Canada	[r]820	[r]1,068	1,116	1,065	[2]1,091
Germany, Federal Republic of	741	731	729	723	730
Norway	664	653	633	637	[2]715
Australia	270	303	379	381	[2]475
Brazil	238	[r]261	[r]256	299	400
China[e]	360	360	360	370	380
France	395	432	[r]436	390	[2]361
Spain	[r]260	386	[r]397	367	[2]358
Venezuela	[r]227	[r]328	314	[e]244	343
Yugoslavia	168	161	[r]173	246	[2]284
Japan	[r]1,010	1,091	[r]771	351	256
United Kingdom	359	[r]374	339	241	250
New Zealand	154	155	154	167	[2]236
Netherlands	258	[r]259	262	251	235
Romania	217	241	251	208	210
India	211	185	213	217	205
Total	[r] [3]12,660	[r]13,402	[r]13,072	11,306	11,882
Other	[r]1,866	[r]1,967	[r]1,990	1,996	1,972
Grand total	[r]14,526	[r]15,369	[r]15,062	13,302	13,854

[e]Estimated. [p]Preliminary. [r]Revised.

[1] Table includes data available through May 23, 1984.

[2] Reported figure.

[3] Data do not add to total shown because of independent rounding.

Table 16.—Leading world producers of chromite[1]

(Thousand metric tons, gross weight)

Country	1979	1980	1981	1982^{p}	1983^{e}
U.S.S.R.^{e}	2,300	2,450	2,400	2,450	2,450
South Africa, Republic of	3,297	3,414	2,870	2,164	[2]2,232
Albania^{e}	^{r}750	^{r}760	^{r}850	^{r}875	900
Zimbabwe	542	^{r}554	536	432	431
Turkey	^{r}372	391	423	406	400
India	310	^{r}320	335	339	360
Finland	435	^{r}362	412	345	340
Philippines	556	496	439	355	330
Brazil	340	313	236	276	280
Total	^{r}8,902	^{r}9,060	8,501	7,642	7,723
Other	^{r}421	^{r}407	261	312	362
Grand total	^{r}9,323	^{r}9,467	8,762	7,954	8,085

^{e}Estimated. ^{p}Preliminary. ^{r}Revised.

[1] Table includes data available through June 6, 1984.

[2] Reported figure.

Table 17.—Leading world producers of mine copper[1]

(Thousand metric tons, Cu content of ore)

Country	1979	1980	1981	1982^{p}	1983^{e}
Chile[2]	1,063	1,068	1,081	1,241	1,190
United States[2]	^{r}1,447	1,181	1,538	1,148	[3]1,038
U.S.S.R.^{e} [2]	^{r}855	900	^{r}940	^{r}970	1,000
Canada[2]	636	716	691	612	625
Zambia	588	596	588	568	543
Zaire	^{r}430	^{r}540	555	519	535
Poland	325	346	294	^{r} ^{e}376	380
Peru[2]	391	367	342	369	[3]336
Philippines	298	305	302	292	309
Australia	238	244	231	245	256
Mexico	107	175	230	239	250
South Africa, Republic of	191	201	209	189	[3]211
China^{e}	200	200	200	200	200
Papua New Guinea	171	147	165	170	183
Total	^{r}6,940	^{r}6,986	7,366	7,138	7,056
Other	^{r}751	^{r}753	825	934	971
Grand total	^{r}7,691	^{r}7,739	8,191	8,072	8,027

^{e}Estimated. ^{p}Preliminary. ^{r}Revised.

[1] Table includes data available through June 20, 1984.

[2] Recoverable.

[3] Reported figure.

Table 18.—Leading world producers of gold[1]

(Thousand troy ounces)

Country	1979	1980	1981	1982[p]	1983[e]
South Africa, Republic of	22,617	21,669	21,121	21,355	[2]21,847
U.S.S.R.[e]	8,160	8,300	8,425	8,550	8,600
Canada	1,644	1,627	1,673	2,081	2,274
United States	964	970	1,379	1,466	1,957
China[e]	200	225	1,700	1,800	1,900
Brazil	[r]320	1,300	1,200	1,500	1,600
Australia	597	548	591	867	1,035
Philippines	535	644	753	834	802
Papua New Guinea	630	452	540	564	[2]582
Chile	111	220	400	544	563
Zimbabwe	388	368	371	426	430
Colombia	269	510	529	482	[2]429
Total	[r]36,435	[r]36,833	38,682	40,469	42,019
Other	[r]2,395	[r]2,372	2,567	2,587	2,514
Grand total	[r]38,830	[r]39,205	41,249	[3]43,057	44,533

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through May 30, 1984.

[2] Reported figure.

[3] Data do not add to total shown because of independent rounding.

Table 19.—Leading world producers of iron ore, iron ore concentrates, and iron ore agglomerates[1]

(Thousand metric tons)

Country	1979	1980	1981	1982[p]	1983[e]
U.S.S.R	[r]241,738	[r]244,713	242,417	244,411	245,000
Brazil	104,083	114,732	97,860	95,000	89,000
Australia	91,717	95,534	84,661	87,694	71,500
China[e]	[r]66,000	[r]68,000	[r]66,000	[r]69,000	71,000
India	39,859	41,936	41,354	40,902	[2]38,800
United States	87,092	70,730	74,348	36,002	38,600
Canada	59,888	48,754	51,985	35,425	[2]33,495
South Africa, Republic of	31,565	26,312	28,319	24,554	[2]16,605
France	31,627	[r]28,981	21,598	19,411	[2]15,967
Liberia	18,345	18,187	19,704	18,268	14,937
Sweden	[r]26,169	27,184	23,225	16,138	[2]13,212
Venezuela	15,260	16,102	15,531	11,200	[2]9,715
Mexico	6,061	7,631	8,020	8,155	8,040
Korea, North[e]	7,400	8,000	8,000	8,000	8,000
Spain	8,826	9,227	8,565	8,262	[2]7,449
Mauritania	9,373	8,936	8,704	8,255	7,400
Chile	7,118	8,270	7,743	5,806	[2]5,974
Yugoslavia	4,617	9,530	4,794	5,106	[2]5,018
Total	[r]856,738	[r]852,759	812,828	741,589	699,712
Other	[r]46,247	[r]43,108	42,232	39,718	39,421
Grand total	[r]902,985	[r]895,867	855,060	781,307	739,133

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through June 21, 1984.

[2] Reported figure.

Table 20.—Leading world producers of crude steel[1]

(Thousand metric tons)

Country	1979	1980	1981	1982[p]	1983[e]
U.S.S.R	149,099	147,941	148,445	147,165	153,000
Japan	111,748	111,395	101,676	99,548	[2]97,164
United States	123,687	101,455	109,613	72,903	[2]76,761
China	34,430	37,120	35,600	37,160	39,950
Germany, Federal Republic of	46,040	43,838	41,610	35,880	[2]35,730
Italy	24,250	26,501	24,777	23,981	[2]21,674
France	23,360	[r]23,176	21,258	18,416	[2]17,612
Czechoslovakia	14,817	15,225	15,270	14,992	[2]15,024
United Kingdom	21,438	11,278	15,576	13,704	[2]14,993
Brazil	[r]13,894	15,339	13,230	12,990	[2]14,659
Poland	19,218	19,485	15,719	14,795	[2]13,600
Romania	12,909	13,175	13,025	13,055	13,100
Canada	16,078	15,887	14,811	11,762	[2]12,828
Spain	12,304	12,586	12,912	13,160	[2]12,731
Korea, Republic of	7,610	8,558	10,754	11,753	[2]11,915
India	9,996	[e]9,420	[e]10,380	10,715	[2]10,305
Belgium	[r]13,553	[r]12,325	12,286	[e]9,900	[2]10,155
South Africa, Republic of	8,868	9,068	9,004	8,271	[2]7,004
German Democratic Republic	7,023	7,308	7,467	7,169	7,000
Mexico	7,117	7,156	7,605	7,048	[2]6,917
Total	[r]677,439	[r]648,236	641,018	584,367	592,122
Other	[r]67,491	[r]65,552	63,766	62,337	65,102
Grand total	[r]744,930	[r]713,788	704,784	[3]646,706	657,224

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Steel ingots and castings. Table includes data available through May 30, 1984.

[2] Reported figure.

[3] Data do not add to total shown because of independent rounding.

Table 21.—Leading world producers of mine lead[1]

(Thousand metric tons, Pb content of ore)

Country	1979	1980	1981	1982[p]	1983[e]
Australia	422	[r]398	388	455	477
United States[2]	526	550	446	513	449
U.S.S.R.[e]	415	420	425	430	435
Canada	[r]342	297	332	341	[3]252
Peru	174	[r]189	193	176	[3]206
China[e]	155	[r]160	[r]160	[r]160	160
Mexico[2]	174	146	157	146	150
Yugoslavia	130	[r]122	119	[e]115	120
Morocco	116	115	116	104	102
Total	[r]2,454	[r]2,397	2,336	2,440	2,351
Other	[r]997	[r]1,051	1,013	968	973
Grand total	[r]3,451	[r]3,448	3,349	3,408	3,324

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through June 13, 1984.

[2] Recoverable.

[3] Reported figure.

Table 22.—Leading world producers of manganese ore[1]

(Thousand metric tons, gross weight)

Country	1979	1980	1981	1982[p]	1983[e]
U.S.S.R	10,244	9,750	9,150	9,821	10,400
South Africa, Republic of	5,182	5,695	5,040	5,217	2,886
Brazil	2,259	[r]2,281	2,042	2,340	2,100
Gabon	2,300	2,147	1,488	1,511	[2]1,857
China[e]	1,500	1,600	1,600	1,600	1,600
Australia	[r]1,697	[r]1,999	1,411	1,132	[2]1,353
India	[r]1,771	[r]1,692	1,526	1,448	[2]1,320
Mexico	493	447	578	509	350
Ghana	272	252	223	160	193
Hungary	83	83	71	83	85
Japan	88	80	87	78	[2]77
Morocco	136	131	110	97	74
Total	[r]26,025	[r]26,157	23,326	23,996	22,295
Other	[r]251	[r]239	169	143	138
Grand total	[r]26,276	[r]26,396	23,495	24,139	22,433

[e]Estimated. [p]Preliminary. [r]Revised.

[1] Table includes data available through June 13, 1984.

[2] Reported figure.

Table 23.—Leading world producers of mine nickel[1]

(Thousand metric tons)

Country	1979	1980	1981	1982[p]	1983[e]
U.S.S.R.[e]	151	154	158	[r]165	170
Canada	126	185	160	89	122
Australia	70	74	74	89	90
New Caledonia	80	87	78	60	63
Indonesia	[r]37	[r]53	49	55	47
Cuba[e]	31	37	39	36	37
South Africa, Republic of	30	26	26	[e]22	21
Dominican Republic	25	16	19	[e]6	20
Total	[r]550	[r]632	603	522	570
Other	[r]137	[r]148	125	126	119
Grand total	[r]687	[r]780	728	[2]640	689

[e]Estimated. [p]Preliminary. [r]Revised.

[1] Table includes data available through May 2, 1984.

[2] Data do not add to total shown because of independent rounding.

Table 24.—Leading world producers of mine tin[1]

(Metric tons, Sn content of ore)

Country	1979	1980	1981	1982[p]	1983[e]
Malaysia	62,995	61,404	59,938	52,330	42,000
U.S.S.R.[e]	35,000	36,000	36,000	37,000	37,000
Indonesia	[r]29,535	[r]32,527	35,392	33,806	27,000
Bolivia	27,648	27,291	29,830	26,773	24,400
Thailand	33,962	33,685	31,474	26,109	[2]19,943
China[e]	14,000	14,600	15,000	15,000	15,000
Brazil	7,005	6,930	8,297	[e]9,500	12,000
Australia	12,571	11,588	12,267	12,126	9,700
United Kingdom	2,373	2,982	3,869	4,208	4,100
Zaire	3,879	3,159	3,321	3,144	3,200
South Africa, Republic of	2,697	2,913	2,811	3,035	[2]2,668
Peru	870	1,077	1,519	1,672	[2]2,368
Total	[r]232,535	[r]234,156	239,718	224,703	199,379
Other	[r]12,759	[r]13,144	13,395	12,473	12,241
Grand total	[r]245,294	[r]247,300	253,113	237,176	211,620

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through June 6, 1984.

[2] Reported figure.

Table 25.—Leading world producers of mine zinc[1]

(Thousand metric tons, Zn content of ore)

Country	1979	1980	1981	1982[p]	1983[e]
Canada	[r]1,204	[r]1,059	1,096	1,189	1,070
U.S.S.R.[e]	770	785	790	[r]800	805
Australia	529	495	518	665	695
Peru	432	488	499	507	[2]553
United States	267	317	312	303	[2]275
Mexico	[r]243	[r]236	207	242	257
Japan	243	238	242	251	[2]256
Sweden	170	167	181	185	[2]203
Ireland	212	229	120	167	186
Spain	143	183	182	173	175
China[e]	160	160	160	160	160
Poland	183	188	147	145	146
Korea, North[e]	145	140	140	140	140
Brazil	98	105	96	112	115
Germany, Federal Republic of	[r]117	[r]121	111	106	114
South Africa, Republic of	54	79	87	92	[2]110
Yugoslavia	102	95	89	84	80
Greenland	87	[r]86	80	[e]77	[2]76
Total	[r]5,159	[r]5,171	5,057	5,398	5,416
Other	[r]826	[r]791	792	840	830
Grand total	[r]5,985	[r]5,962	[3]5,848	6,238	6,246

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through July 3, 1984.

[2] Reported figure.

[3] Data do not add to total shown because of independent rounding.

Table 26.—Leading world producers of hydraulic cement[1]

(Thousand metric tons)

Country	1979	1980	1981	1982[p]	1983[e]
U.S.S.R	123,019	125,049	127,169	123,681	128,000
China	73,900	[r]79,860	84,000	94,072	108,250
Japan	[r]87,803	[r]87,958	84,832	80,686	[2]80,650
United States	77,931	69,589	66,163	58,369	[2]64,725
Italy	39,289	41,772	41,553	39,727	[2]39,217
Brazil	24,874	27,193	26,051	25,644	[2]38,225
Germany, Federal Republic of	[r]37,036	[r]35,911	32,862	31,168	31,000
Spain (including Canary Islands)	27,912	[r]28,010	28,571	[e]29,000	[2]30,633
India	18,264	17,700	20,760	22,498	25,000
France	28,825	29,104	28,229	26,141	[2]24,504
Korea, Republic of	16,413	[r]15,611	15,617	17,887	[2]21,282
Mexico	15,178	16,260	18,066	19,298	16,850
Poland	19,176	18,443	14,225	16,035	[2]16,163
Romania	15,598	15,611	14,746	14,995	15,000
Taiwan	[r]11,897	14,062	14,342	13,432	[2]14,810
Turkey	[r]13,783	[r]12,874	15,043	15,778	[2]13,596
United Kingdom	16,140	14,808	12,828	12,962	[2]13,396
German Democratic Republic	12,273	[r]12,440	12,204	11,721	12,000
Czechoslovakia	10,258	10,545	10,646	10,325	[2]10,498
Iran[e]	9,000	8,000	8,000	9,500	10,000
Total	[r]678,569	[r]680,800	675,907	672,919	713,799
Other	[r]193,771	[r]202,668	212,534	206,504	211,856
Grand total	[r]872,340	[r]883,468	888,441	879,423	925,655

[e]Estimated. [p]Preliminary. [r]Revised.

[1] Table includes data available through June 20, 1984.

[2] Reported figure.

Table 27.—Leading world producers of diamond[1]

(Thousand carats)

Country	1979	1980	1981	1982[p]	1983[e]
Zaire	8,734	10,235	9,000	[e]9,000	[2]11,438
Botswana	4,394	5,101	4,961	7,769	[2]10,731
U.S.S.R.[e]	10,700	10,850	10,600	10,600	10,700
South Africa, Republic of	8,384	8,520	9,526	9,154	10,311
Australia	--	48	205	557	[2]6,200
China[e]	NA	1,800	1,900	2,000	2,000
Angola	841	1,480	1,400	1,225	1,200
Namibia	1,653	1,560	1,248	1,014	[2]963
Total	[r]34,706	[r]39,594	38,840	41,319	53,543
Other	[r]4,724	[r]4,283	3,717	3,048	2,576
Grand total	39,430	43,877	42,557	44,367	56,119

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1] Gem and industrial grades undifferentiated. Table includes data available through May 16, 1984.

[2] Reported figure.

Table 28.—Leading world producers of nitrogen in ammonia[1]

(Thousand metric tons, N content)

Country	1979	1980	1981	1982[p]	1983[e]
China[e]	8,821	9,990	[r]12,193	[r]12,711	15,000
U.S.S.R	12,200	12,600	12,900	14,000	14,500
United States	[r]13,895	[r]14,656	14,202	11,764	[2]10,202
India[3]	2,256	2,221	3,193	3,287	3,200
Romania	2,335	2,248	2,381	2,587	2,600
Canada	1,981	[r]2,096	2,176	2,062	[2]2,374
Mexico	1,359	1,548	1,796	2,031	2,160
France	2,150	2,085	2,250	1,900	1,900
Netherlands	1,916	1,874	1,814	1,655	1,744
Germany, Federal Republic of	2,161	2,044	1,962	1,570	[2]1,703
United Kingdom	1,666	1,633	1,780	1,716	1,700
Japan	2,328	2,110	1,833	1,652	1,546
Poland	1,525	[r]1,478	1,389	1,380	1,300
Indonesia	623	938	920	1,028	1,149
German Democratic Republic	1,078	1,182	1,205	1,170	1,100
Italy	[r]1,430	[r]1,397	1,207	1,046	[2]1,060
Total	[r]57,724	[r]60,100	63,201	61,559	63,238
Other	[r]13,160	[r]13,448	13,134	13,134	13,602
Grand total	[r]70,884	[r]73,548	76,335	74,693	76,840

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through May 23, 1984.

[2] Reported figure.

[3] Data given are for years beginning Apr. 1 of that stated.

Table 29.—Leading world producers of phosphate rock[1]

(Thousand metric tons)

Country	1979	1980	1981	1982[p]	1983[e]
United States	51,611	54,415	53,624	37,414	[2]42,573
U.S.S.R.[e]	24,400	25,300	25,600	[r]26,700	27,000
Morocco[3]	20,032	18,824	18,562	17,754	20,106
China[e]	8,517	10,726	11,500	[r]11,720	12,500
Tunisia	4,154	4,582	4,596	4,196	5,924
Jordan	2,825	3,911	4,244	4,390	4,749
Brazil	1,628	2,612	3,238	2,732	3,208
Israel	2,086	2,307	1,919	2,148	2,969
South Africa, Republic of	3,221	3,185	2,718	3,173	2,742
Togo	2,920	2,933	2,215	2,128	2,081
Total	[r]121,394	[r]128,795	128,216	112,355	123,852
Other	[r]10,431	[r]10,419	9,953	9,847	10,774
Grand total	[r]131,825	[r]139,214	138,169	122,202	134,626

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Includes only phosphate rock; Thomas slag and guano are excluded. Table includes data available through Apr. 13, 1984.

[2] Reported figure.

[3] Includes output from Western Sahara.

Table 30.—Leading world producers of marketable potash[1]

(Thousand metric tons, K_2O equivalent)

Country	1979	1980	1981	1982[p]	1983[e]
U.S.S.R	6,635	8,064	8,449	8,079	9,300
Canada	7,074	7,532	6,549	5,309	[2]6,203
German Democratic Republic	3,395	3,422	3,460	3,434	3,430
Germany, Federal Republic of	2,616	2,737	2,592	2,057	2,100
France	1,921	1,894	1,831	1,701	1,900
United States	2,225	2,239	2,156	1,784	[2]1,429
Israel	737	797	839	1,004	1,000
Total	[r]24,603	[r]26,685	25,876	23,368	25,362
Other	[r]1,165	[r]1,172	1,204	1,296	1,316
Grand total	25,768	[r]27,857	27,080	24,664	26,678

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through Mar. 27, 1984.

[2] Reported figure.

Table 31.—Leading world producers of salt[1]

(Thousand metric tons)

Country	1979	1980	1981	1982[p]	1983[e]
United States (including Puerto Rico)	41,567	36,630	35,303	34,392	[2]31,387
U.S.S.R.[e]	14,300	14,600	15,200	[r]15,800	16,200
China	14,770	17,280	18,320	16,384	15,872
Germany, Federal Republic of	[r]15,090	[r]11,396	12,541	10,978	10,500
India	[r]7,036	[r]8,008	8,932	7,312	10,004
Canada	6,881	7,029	7,240	7,940	8,590
United Kingdom	[r]7,820	[r]7,154	6,720	7,637	7,600
France	8,057	[e]7,103	6,636	6,694	7,120
Australia	[r]5,171	[r]5,665	6,420	6,100	6,000
Mexico	6,169	6,575	7,953	5,480	5,500
Romania	4,720	[r]5,056	[e]5,000	[r] [e]5,000	5,000
Italy[e]	[r]5,690	[r]5,297	[r]4,574	[r]4,605	4,700
Poland	4,429	[r]4,533	4,271	[r] [e]4,300	4,300
Brazil	[r]3,555	[r]3,838	3,605	3,724	3,850
Spain	3,448	[r]3,509	3,693	3,289	3,300
German Democratic Republic	3,052	3,128	3,112	3,075	3,052
Netherlands	3,951	3,464	3,578	3,191	3,040
Turkey	[r]945	[r]1,179	1,396	1,314	1,400
Japan	1,079	1,112	1,100	1,020	1,200
Total	[r]157,730	[r] [3]152,557	155,594	148,235	148,615
Other	[r]15,685	[r]16,383	15,834	16,902	16,983
Grand total	[r]173,415	[r]168,940	171,428	165,137	165,598

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through June 6, 1984.

[2] Reported figure.

[3] Data do not add to total shown because of independent rounding.

Table 32.—Leading world producers of elemental sulfur[1]

(Thousand metric tons)

Country	1980				1981				1982^{p}				1983^{e}			
	Native	From py-rites	Byprod-uct	Total	Native	From py-rites	Byprod-uct	Total	Native	From py-rites	Byprod-uct	Total	Native	From py-rites	Byprod-uct	Total
U.S.S.R.^{e}	^{2}2,800	3,550	3,240	9,590	$^{r\ 2}$2,800	3,600	^{r}3,290	^{r}9,690	$^{r\ 2}$2,700	^{r}3,600	^{r}3,340	^{r}9,640	^{2}2,600	3,600	3,390	9.590
United States	^{3}6,390	322	5,154	11,866	^{3}6,348	307	5,490	12,145	4,210	265	5,312	9,787	$^{3\ 4}$3,202	W	^{4}6,088	9,290
Canada	--	12	7,248	7,260	--	10	6,789	6,799	--	9	6,272	6,281	--	5	6,620	6,625
Poland	$^{e\ 2}$5,185	--	^{e}350	5,535	$^{e\ 2}$4,773	--	^{e}350	5,123	$^{e\ 2}$4,935	--	^{e}350	5,285	^{2}4,890	--	350	5,240
Japan	--	311	2,473	2,784	--	293	2,316	2,609	--	276	2,319	2,595	--	300	2,345	2,645
China^{e}	200	1,700	300	2,200	200	1,800	300	2,300	200	1,800	300	2,300	200	2,100	300	2,600
France	--	--	2,216	2,216	--	--	2,042	2,042	--	--	2,061	2,061	--	--	2,063	2,063
Mexico	^{3}1,700	--	517	^{e}2,217	^{3}1,652	--	526	^{e}2,178	^{3}1,391	--	525	^{e}1,916	^{3}1,104	--	529	1,633
Germany, Federal Republic of	--	222	1,577	1,799	--	213	1,519	1,732	--	229	1,592	1,821	--	200	1,340	1,540
Spain	--	1,096	140	^{e}1,236	--	1,118	150	^{e}1,268	--	1,029	^{e}138	$^{r\ e}$1,167	--	1,000	131	1,131
Saudi Arabia^{e}	1	--	460	461	NA	--	600	600	--	--	^{r}900	^{r}900	--	--	800	800
South Africa, Republic of	--	493	125	618	--	502	127	629	--	465	160	625	--	^{4}474	^{4}157	631
Finland	--	144	^{e}277	^{e}421	--	184	^{e}264	^{e}448	--	177	$^{r\ e}$280	$^{r\ e}$457	--	180	280	460
Italy	23	331	^{e}250	604	20	261	$^{r\ e}$230	511	10	269	$^{r\ e}$210	489	8	240	210	458
Sweden	--	^{r}202	$^{r\ e}$167	^{r}369	--	204	^{e}168	372	--	206	^{e}170	376	--	208	170	378
German Democratic Republic^{e}	--	10	350	360	--	10	350	360	--	(5)	^{r}360	360	--	--	360	360
Romania	--	^{r}350	140	^{r}490	--	^{r}300	150	^{r}450	--	^{r}200	150	^{r}350	--	200	150	350
Iraq^{e}	^{3}700	--	40	740	$^{r\ 3}$200	--	40	^{r}240	$^{r\ 3}$300	--	40	^{r}340	^{3}300	--	40	340
Brazil	--	25	131	156	--	44	119	163	--	54	130	184	^{3}1	55	260	316
Bulgaria^{e}	--	300	70	370	--	^{r}200	70	^{r}270	--	^{r}200	70	^{r}270	--	200	70	270
Belgium^{e}	--	--	270	270	--	--	270	270	--	--	^{r}250	^{r}250	--	--	250	250

Norway	--	193	[e]46	[e]239	--	[r]200	[e]46	[r] [e]246	--	195	[e]46	[r] [e]241	--	198	50	248
Korea, North[e]	--	250	[r]30	[r]280	--	225	[r]30	[r]255	--	200	[r]30	[r]230	--	200	30	230
Greece	--	61	4	[e]65	--	[e]60	11	[e]71	--	[e]60	105	[e]165	--	60	125	185
Turkey	23	33	[e]70	[e]126	28	29	[e]120	[e]177	29	30	[e]126	[e]185	31	25	[4]124	180
Netherlands[e]	--	--	142	142	--	--	145	145	--	--	165	165	--	--	175	175
India	--	34	[e]120	[e]154	--	23	[e]96	[e]119	--	22	[r] [e]113	[r] [e]135	--	25	125	150
Total	[r]17,022	[r]9,639	[r]25,907	[r]52,568	16,021	9,583	25,608	51,212	13,775	9,286	25,514	48,575	12,336	9,270	26,532	48,138
Other	[r]206	[r]653	[r]1,493	[r]2,352	[r]221	[r]622	[r]1,295	[r]2,138	199	606	1,396	2,201	199	676	1,459	2,334
Grand total	[r]17,228	[r]10,292	[r]27,400	[r]54,920	16,242	10,205	26,903	53,350	13,974	9,892	26,910	50,776	12,535	9,946	27,991	50,472

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available. W Withheld to avoid disclosing company proprietary data.

[1] Includes all recorded production of sulfur, regardless of the form in which it is recovered. Thus, it includes elemental sulfur, whether mined by conventional methods or by the Frasch process, as well as (1) elemental sulfur and the S content of compounds such as H_2S, SO_2, and H_2SO_4 recovered as a principal product of pyrite mining and as a byproduct of the recovery of crude oil and natural gas and as a byproduct of petroleum refining, coal treatment, and metal smelting and/or refining; and (2) sulfur recovered from tar sands, spent oxides, and other miscellaneous sources. Table includes data available through Aug. 1984.

[2] Includes Frasch process sulfur as follows, in thousand metric tons: Poland: 1980—4,667, 1981—4,295, 1982—4,441, and 1983—4,400; the U.S.S.R. (estimated): 1980—800, 1981—800, 1982—800, and 1983—800; and total of individually listed countries and grand total: 1980—14,257, 1981—13,295, 1982—11,142, and 1983—9,807. The balance is mined elemental sulfur.

[3] Entirely Frasch process sulfur.

[4] Reported figure.

[5] Revised to zero.

Table 33.—Leading world producers of coal (all grades)[1]

(Million metric tons)

Country	1980			1981			1982[p]			1983[e]		
	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total
U.S.S.R	163	553	716	160	544	704	163	555	718	[2]162	[2]554	[2]716
China	(3)	620	620	(3)	621	621	(3)	651	651	(3)	715	715
United States	42	[r]710	[r]752	46	701	747	49	711	760	[2]47	[2]665	[2]712
German Democratic Republic	258	--	258	267	--	267	276	--	276	280	--	280
Poland	37	193	230	36	163	199	38	189	227	[2]43	[2]191	[2]234
Germany, Federal Republic of	130	87	217	131	88	219	127	89	216	[2]124	[2]82	[2]206
Australia	33	[r]94	[r]127	33	111	144	38	119	157	[2]35	[2]121	[2]156
South Africa, Republic of	--	[r]132	[r]132	--	130	130	--	140	140	--	[2]146	[2]146
India	5	114	119	6	125	131	7	128	135	[2]7	[2]136	[2]143
Czechoslovakia	96	28	124	96	27	123	99	27	126	100	27	127
United Kingdom	--	130	130	--	128	128	--	125	125	--	[2]118	[2]118
Yugoslavia	47	(4)	47	52	(4)	52	54	(4)	54	[2]58	(4)	58
Canada	6	31	37	7	33	40	7	35	42	[2]8	[2]37	[2]45
Korea, North[e]	(4)	45	45	(4)	45	45	(4)	45	45	(4)	45	45
Spain	15	13	28	21	14	35	24	15	39	24	16	40
Romania	27	8	35	27	[e]8	35	27	[e]8	35	27	8	35
Bulgaria	[r]30	(4)	[r]30	29	(4)	29	32	(4)	32	33	(4)	33
Greece	23	--	23	27	--	27	27	--	27	30	--	30
Hungary	[r]24	3	[r]27	23	3	26	23	3	26	[2]22	[2]3	[2]25
France	3	18	21	3	19	22	3	17	20	[2]3	[2]17	[2]20
Total	[r]939	[r]2,779	[r]3,718	964	2,760	3,724	994	2,857	3,851	1,003	2,881	3,884
Other	[r]24	[r]72	[r]96	28	88	116	32	93	125	38	93	131
Grand total[5]	[r]963	[r]2,850	[r]3,813	992	2,847	3,839	1,026	2,950	3,976	1,041	2,974	4,015

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through Sept. 9, 1984.

[2] Reported figure.

[3] Output small; included under "Bituminous and anthracite."

[4] Less than 1/2 unit.

[5] Data may not add to totals shown bacause of independent rounding.

Table 34.—Leading world producers of marketed natural gas[1]

(Billion cubic feet)

Country	1979	1980	1981	1982[p]	1983[e]
U.S.S.R	14,359	15,369	16,430	17,682	[2]18,929
United States	[r]20,471	[r]20,180	19,956	18,520	[2]16,657
Netherlands	[r]3,321	[r]3,211	2,981	2,548	2,500
Canada	3,335	3,068	2,399	2,683	[2]2,465
Algeria	516	411	466	1,048	[2]1,650
United Kingdom	1,410	1,317	1,321	1,263	[2]1,304
Mexico	915	1,129	1,214	1,279	[2]1,274
Romania	1,161	1,199	[e]1,200	[r] [e]1,200	1,200
Indonesia	399	696	720	926	[2]1,032
Norway	759	922	920	897	[2]904
Germany, Federal Republic of	725	[r]658	666	569	[2]622
Venezuela	576	589	584	527	559
Italy	476	443	496	512	[2]459
China	512	504	450	414	431
Australia	296	338	401	409	[2]420
Total	[r]49,231	[r]50,034	50,204	50,477	50,406
Other	[r]5,194	[r]4,484	4,716	4,906	5,136
Grand total	[r]54,425	[r]54,518	54,920	55,383	55,542

[e]Estimated. [p]Preliminary. [r]Revised.

[1] Comprises all gas collected and utilized as a fuel or as a chemical industry raw material as well as that used for gas lift in fields, including gas used in oilfields and/or gasfields as a fuel by producers, even though it is not actually sold. Excludes gas produced and subsequently vented, flared, or reinjected to reservoirs. Table includes data available through Sept. 9, 1984.

[2] Reported figure.

Table 35.—Leading world producers of natural gas liquids[1]

(Million 42-gallon barrels)

Country[2]	1979	1980	1981	1982[p]	1983[e]
United States	[r]578	[r]576	587	566	[3]571
Algeria	34	[r]68	78	105	[3]180
U.S.S.R.[e]	125	127	134	145	145
Saudi Arabia	[r]113	[r]135	164	157	125
Canada	123	115	120	117	[3]114
Mexico	57	71	88	[e]95	95
United Arab Emirates (Abu Dhabi, Dubai, Sharjah)	15	36	[e]40	[r] [e]54	71
United Kingdom	5	8	14	28	37
Total	[r]1,050	[r]1,136	1,225	1,267	1,338
Other	[r]150	[r]136	126	113	131
Grand total	[r]1,200	[r]1,272	1,351	1,380	1,469

[e]Estimated. [p]Preliminary. [r]Revised.

[1] Every effort has been made to include only those natural gas liquids produced by natural gas processing plants and to exclude natural gas liquids obtained from field treatment facilities including wellhead separators, because the latter are normally blended with crude oil and thus are included in crude oil output statistics. In some cases, however, sources do not clearly specify whether data presented represent only output of natural gas processing plants or if they include field output. Thus, some of the figures may include field condensate. Table includes data available through May 16, 1984.

[2] In addition to the countries listed, China, Czechoslovakia, the German Democratic Republic, the Federal Republic of Germany, and Italy may also produce natural gas liquids in substantial quantities, but available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

Table 36.—Leading world producers of crude oil[1]

(Million 42-gallon barrels)

Country	1979	1980	1981	1982[p]	1983[e]
U.S.S.R	4,304	4,434	4,475	4,503	[2]4,528
United States	[r]3,121	[r]3,146	3,129	3,157	[2]3,159
Saudi Arabia[3]	3,479	3,614	3,580	2,366	[2]1,834
Mexico	533	708	844	1,002	[2]973
Iran	1,121	550	692	873	[2]892
United Kingdom	[r]565	[r]582	647	741	798
China	775	773	739	745	774
Venezuela	860	793	768	692	[2]656
Canada	545	523	468	464	[2]495
Indonesia	580	577	585	488	[2]490
Nigeria	840	753	525	472	452
United Arab Emirates (Abu Dhabi, Dubai, Sharjah)	668	624	548	456	409
Libya	763	670	408	[r] [e]418	402
Iraq	1,252	969	326	[e]310	400
Total	[r]19,406	[r]18,716	17,734	16,687	16,262
Other	[r]3,512	[r]3,180	2,921	2,861	3,130
Grand total	[r]22,918	[r]21,896	20,655	19,548	19,392

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through Sept. 9, 1984.

[2]Reported figure.

[3]Includes the country's share of production from the Kuwait-Saudi Arabia Partitioned Zone.

Table 37.—Leading world producers of refined oil[1]

(Million 42-gallon barrels)

Country	1979	1980	1981	1982[p]	1983[e]
United States (including Puerto Rico and Virgin Islands)	5,860	5,619	5,358	5,113	[2]4,945
U.S.S.R.[e]	3,513	3,620	3,703	3,783	3,800
Japan	1,696	1,611	1,464	1,377	[2]1,308
Germany, Federal Republic of	953	875	752	720	[2]687
Italy	885	721	741	693	[2]649
United Kingdom	[r]731	[r]647	592	590	[2]594
France	978	881	720	617	[2]565
Canada	712	694	696	589	[2]558
China[e]	470	470	450	[r]475	500
Mexico	358	425	471	462	[2]467
Netherlands	[r]454	[r]385	315	353	380
Saudi Arabia[3]	[r]317	[r]347	348	338	[2]354
Brazil	418	[r]395	385	380	350
Spain (including Canary Islands)	355	367	357	337	[2]337
Venezuela	369	341	319	318	315
Singapore	264	262	312	305	306
Total	[r]18,333	[r]17,660	16,983	16,450	16,115
Other	[r]5,003	[r]4,961	4,795	4,891	5,062
Grand total	[r]23,336	[r]22,621	21,778	21,341	21,177

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through Sept. 9, 1984.

[2]Reported figure.

[3]Includes the country's share of production from the Kuwait-Saudi Arabia Partitioned Zone.

The Mineral Industry of Albania

By Walter G. Steblez[1]

Albania's mineral industry continued to be the dominant industrial branch of the economy. Exports of mineral commodities and mineral fuels remained the country's chief source of hard currency, with chromite and petroleum products as the main hard-currency earners.

Albania's centrally planned industrial targets for 1983 were not met. Total 1983 industrial production rose 3% compared with that of 1982, but this increase was below that of 1982. Significantly, the net change in the country's national income was not reported by official sources, as it had been in past years.

The downturn in industrial performance during the year was, reportedly, due in part to a substantial reduction in hydroelectric power because of severe drought. Other reasons, more consonant with past difficulties, were unrealistically high goals, low productivity, shortages of qualified technical staff in the mineral industry, especially in the petroleum and gas sector, and depressed world markets.

Reportedly, development and construction work was completed at new coal, copper, and chromite mines. Work was also reportedly continued on the construction of a new copper concentrator and the enlargement of another.

Government Policies and Programs.—The maintenance of the country's self-sufficiency for most mineral commodities and its status as a net exporter of fuels and minerals remained chief goals of the Albanian Government. To this end, increased efforts were made to produce more competent and realistic studies for the annual and 5-year central plans. Past practices by the state central planning authorities set unrealistically high goals for mining and heavy industry. Significant production shortfalls in recent years were blamed on the lack of accurate engineering and geological studies. The Government's policy of using conscripted "volunteer" labor at new mines, plants, and other capital projects also apparently resulted in low worker morale and low labor productivity.

Official reports on 1984 plans for the economy again did not mention net changes in national income. Industrial production in 1984 was to grow by 8.5% but only if the targets set for the petroleum, gas, and chromium industries were met. Mineral projects that were not completed in 1983 were to be extended through 1984; these included the construction of facilities for the production of chromite, coal, copper, quartz, and other minerals.

PRODUCTION

Chromite, petroleum, and petroleum products, Albania's commercially most important mineral commodities, apparently fell steeply below production norms. The Government's annual recital of industrial achievements mentioned production increases for the coal, copper, and steel industries. Chromium and petroleum, however, were not included.

Albania has published short, incomplete statistical reports at 5-year intervals. Production for intervening years therefore must be estimated on the basis of published percentage increases.

Table 1.—Albania: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
Asphalt and bitumen, natural[e] [3] thousand tons	1,650	1,780	1,800	1,800	1,800
Cement, hydraulic do	840	[e]1,000	[e]1,100	[e]1,000	1,100
Chromium:					
Chromite, gross weight do	1,015	[e]1,077	[e]1,140	[e]1,200	1,200
Marketable ore do	760	850	875	[e]900	900
Coal: Lignite[e] do	1,430	1,540	1,600	1,740	1,800
Cobalt, mine output, metal content[e] [4]	306	330	340	340	350
Copper: [e]					
Mine output, metal content	14,000	15,300	15,500	16,200	16,500
Metal, primary and secondary:					
Smelter	9,700	9,900	10,000	11,200	11,500
Refined	7,500	7,700	9,000	9,000	10,000
Gas, natural, gross production[e] [5] million cubic feet	13,000	13,200	13,500	15,800	15,000
Iron and steel:					
Iron ore, nickeliferous:					
Gross weight	530,000	[e]550,000	[e]600,000	[e]600,000	650,000
Iron content	185,500	[e]192,500	200,000	[e]200,000	220,000
Ferroalloys, ferrochromium[e]	NA	3,500	28,000	30,000	35,000
Semimanufactures[e]	28,000	30,000	31,000	34,000	35,000
Nickel, mine output, metal content[e]	5,300	5,500	5,600	5,800	6,000
Nitrogen: N content of ammonia	72,000	75,000	76,000	76,000	76,000
Petroleum:					
Crude:					
As reported million tons	1,600	1,700	1,700	1,700	1,500
Converted thousand 42-gallon barrels	10,700	11,300	11,300	11,300	9,900
Refinery products:[e]					
Gasoline do	1,600	1,700	1,700	1,700	1,500
Kerosine do	500	540	600	600	500
Distillate fuel oil do	2,270	2,400	2,300	2,300	2,000
Residual fuel oil do	3,600	3,800	3,500	3,500	3,000
Lubricants do	100	105	120	120	100
Other do	2,600	2,700	3,000	3,000	2,600
Total[6] do	10,670	11,245	11,220	11,220	9,700
Salt[e]	62,500	66,500	66,500	66,500	70,000
Sodium compounds, n.e.s.: Sodium carbonate, calcined (soda ash)[e]	23,300	25,000	25,500	25,000	25,000

[e] Estimated. [p] Preliminary. NA Not available.

[1] Table includes data available through July 1984.

[2] In addition to the commodities listed, a variety of crude construction materials (common clay, sand and gravel, and stone) are undoubtedly produced, but output is not reported quantitatively and available information is inadequate to make reliable estimates of output levels. Also, metallic nickel production reportedly began in 1978, but data on the level of production are not available.

[3] Includes petroleum refinery-produced asphalt and bitumen.

[4] Calculated from reported and estimated weight of nickeliferous ore; the amount of cobalt recovered, if any, is conjectural.

[5] Separate data on marketable production are not available, but gross and marketed output are regarded as nearly equal.

[6] Sums of listed products only; no estimates have been made for other products produced.

TRADE

In 1983, as in 1982, Albania did not meet its trade plan, because of unrealistic goals, a depressed market, and falling productivity in key sectors of mineral industry. Contractual export obligations of electric power and ores to Yugoslavia, Albania's traditionally largest trading partner, were not met.

Despite official claims of economic self-sufficiency and official prohibition against foreign credit, Albania's economy was nevertheless highly dependent on the world market for modern technology. Capital needed to upgrade the country's small-scale and outdated industries had to be imported. In turn, minerals and fuels had to be exported to pay for necessary imports, and Albania's mineral industry was necessarily export oriented.

Commercial agreements for 1984 were signed with centrally planned economy countries, as well as with the market economy countries of Europe. The 1984 trade agreement with Romania called for exports of Albanian bauxite, chromite, coal, semifabricated copper products, petroleum, sulfur, etc., in exchange for oilfield equipment, spare parts for mining equipment, and other producer durables. The trade agreement with the German Democratic Republic provided for Albanian exports of chromite and copper cable, among other items, in exchange for trucks, machine tools, and other durables. Similarly, the agreement with Czechoslovakia called for Albanian exports of nonferrous metals, asphalt, and other raw materials, and imports of trucks, rolling stock, and other durables.

In 1983, negotiations were conducted with the Federal Republic of Germany and interest was expressed in increasing Albanian exports of chromite, nickel, and marble in exchange for imports of West German steel, machinery, and chemicals. During the year, a transportation agreement established a ferry link between the Albanian port of Durrës and the Italian port of Trieste in the Adriatic. The link was expected to provide a new channel for Albanian exports to central Europe as well as to Italy. An Albanian trade delegation to Italy also held exploratory meetings at Salento and Bari with Italian authorities for the possible expansion of trade between the two countries. The possible shipment of Albanian bauxite, coal, and iron ore was discussed.

Significantly, commercial relations were reestablished with China after an interruption of 6 years. It was reported that chromite was exported to China in exchange for agricultural products.

Table 2.—Albania: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, unwrought	--	74	--	All to Italy.
Chromium: Ore and concentrate	453,550	426,945	3,816	Yugoslavia 109,472; Italy 88,192; West Germany 52,936.
Copper: Metal including alloys:				
Scrap	174	NA		
Unwrought	207	199	--	France 100; Austria 99.
Semimanufactures	207	251	--	All to Yugoslavia.
Iron and steel: Metal:				
Ferrochromium	32,679	25,651	--	Netherlands 6,346; West Germany 5,261; Spain 5,022.
Semimanufactures	306	NA		
Nickel:				
Ore and concentrate	--	458	--	All to West Germany.
Matte and speiss	3	314	--	All to Japan.
Ash and residue containing nickel	--	165	--	All to Netherlands.
Platinum-group metals: Waste and sweepings value, thousands	--	$169	--	All to Italy.
Silver: Waste and sweepings[2] do.	$305	NA		
Zinc: Metal including alloys, semimanufactures	--	15	--	All to Yugoslavia.
NONMETALS				
Cement	25,550	14,774	--	Do.
Pyrite, unroasted	22,537	6,248	--	Italy 6,048.
Salt and brine	941	3,503	--	All to Yugoslavia.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	908	NA		
Petroleum refinery products:				
Gasoline 42-gallon barrels	1,006,000	1,127,568	--	Italy 748,553; France 257,193.
Distillate fuel oil do.	443,474	93,504	--	Italy 78,510.
Bitumen and other residues do.	136,453	NA		
Unspecified do.	363,702	300,000	--	All to Poland.

[p] Preliminary. NA Not available.

[1] Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Albania, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2] May include other precious metals.

Table 3.—Albania: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982^{p}	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Unwrought	721	853	--	Hungary 703.
Semimanufactures	1,645	1,954	--	Yugoslavia 1,301; Hungary 540.
Copper: Metal including alloys:				
Scrap	366	NA		
Unwrought	--	339	--	West Germany 249.
Semimanufactures	580	702	--	West Germany 322; Yugoslavia 236.
Iron and steel:				
Iron ore and concentrate including roasted pyrite	30,758	NA		
Metal:				
Pig iron, cast iron, related materials	8,022	650	--	All from West Germany.
Ferroalloys:				
Ferrochromium	220	NA		
Ferromanganese	1,847	350	--	All from Yugoslavia.
Ferrosilicomanganese	78	NA		
Ferrosilicon	2,441	NA		
Unspecified	252	1,461	--	Yugoslavia 1,448.
Steel, primary forms	67	96	--	All from Italy.
Semimanufactures:				
Bars, rods, angles, shapes, sections	30,133	17,347	--	Yugoslavia 11,090; Hungary 4,053.
Universals, plates, sheets	11,898	17,864	--	Poland 6,965; Yugoslavia 4,991.
Hoop and strip	370	988	--	West Germany 745.
Rails and accessories	4,397	3,009	--	All from Yugoslavia.
Wire	1,435	1,900	--	Yugoslavia 1,134; Austria 457.
Tubes, pipes, fittings	16,803	19,003	--	West Germany 5,954; Japan 5,526.
Unspecified	11,249	43,734	--	Poland 23,734; Czechoslovakia 20,000.
Lead: Metal including alloys:				
Unwrought	151	NA		
Semimanufactures	265	136	--	West Germany 83.
Magnesium: Metal including alloys, all forms	9	9	--	All from Yugoslavia.
Nickel: Metal including alloys:				
Unwrought	4	5	--	Netherlands 4.
Semimanufactures	6	17	--	Italy 16.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$59	$109	--	West Germany $107.
Tin:				
Ore and concentrate	60	NA		
Metal including alloys:				
Unwrought	55	45	--	West Germany 35.
Semimanufactures	--	2	--	All from West Germany.
Titanium: Ore and concentrate	--	170	--	All from Netherlands.
Tungsten: Metal including alloys, all forms	(2)	8	--	West Germany 4; United Kingdom 3.
Zinc: Metal including alloys, unwrought	61	NA		
Other:				
Ores and concentrates	839	1	--	All from West Germany.
Oxides and hydroxides	8	137	--	Austria 136.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	93	54	--	Italy 33; Yugoslavia 18.
Asbestos, crude	2,718	120	--	All from Italy.
Cement	27,855	2,260	--	Yugoslavia 2,250.
Clays, crude	348	389	--	United Kingdom 223; France 111.
Diamond: Gem, not set or strung value, thousands	--	$29	--	All from Italy.
Feldspar, fluorspar, related materials	839	1,152	--	Italy 608; France 478.
Fertilizer materials: Manufactured, potassic	625	38	--	All from West Germany.
Graphite, natural	70	146	--	West Germany 144.
Magnesium compounds	8	530	--	Yugoslavia 520.
Phosphates, crude	--	38,155	--	All from Egypt.
Stone, sand and gravel	2,405	4,221	--	Yugoslavia 4,179.
Sulfur: Sulfuric acid	20	7	--	All from West Germany.
Talc, steatite, soapstone, pyrophyllite	610	1,055	--	Yugoslavia 900; Italy 103.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	27	62	--	West Germany 60.
Coal: Anthracite and bituminous	186,995	308,081	223,780	West Germany 78,473.
Coke and semicoke	9,480	7,000	--	All from Poland.

See footnotes at end of table.

Table 3.—Albania: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982^p	Sources, 1982: United States	Sources, 1982: Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products:				
Gasoline ______42-gallon barrels__	6,256	4,276	--	Italy 4,267.
Mineral jelly and wax _____do____	2,857	7,052	--	Yugoslavia 7,005.
Lubricants_____________do____	33,936	15,344	--	Italy 8,190; Switzerland 3,850.
Unspecified ___________do____	60	93	--	West Germany 56; France 37.

^{p}Preliminary. NA Not available.

[1] Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Albania, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Chromite.—Albania's chromite production plan was not met. Management and productivity problems that were reported in 1982 continued into 1983. Moreover, an increasing amount of lower grade ores has been mined in recent years to satisfy planned gross output targets. Hard lump ore was mined in the Bulquizë area in the Dibre District. The large Bulquizë Todo Manco Mine produced about 44% of chromite production and accounted for approximately 50% of the exports in 1983.

The balance of the mined chromite had to be hand cobbed or concentrated at the country's two beneficiation plants at Kalimash and Bulquizë, which had a total throughput capacity of about 400,000 tons per year. In addition, a substantial amount of low-grade ore was exported. Domestic consumption was limited mostly to charge chrome production at the 30,000-ton-per-year Burrel plant.

With preliminary plans setting a 29% mine output increase in 1985 over the 1980 production level, new concentration facilities were reportedly planned for the chromium industry. By 1985, Albania plans to concentrate 50% of its low-grade ores. Eventual concentration of existing mine tailings to a 55% Cr_2O_3 content was also planned.

In 1983, Albania showed significant commercial activity in the Far East market. Having underbid competitors by as much as $10 per ton and established a reputation as a reliable supplier of chromite, Albania gradually began to increase ore prices offered to Tokyo dealers to world levels, apparently also reducing barter arrangements and increasing sales for hard currency. However, its position as a chromite supplier to this area was itself threatened by expected freight rate increases in 1984 and competition from Indian sources. A bilateral trade agreement with China allowed for exports of about 80,000 tons of chromite and an unspecified amount of ferrochrome in exchange for Chinese agricultural goods.

Low-priced Albanian ferrochromium offerings on top of depressed prices caused concern among European traders in 1983. Reportedly, a chief obstacle to increased sales to Western Europe had been Albania's lack of crushing facilities for charge chrome, which was sold in 10- by 150-millimeter blocks. Reportedly, Albania planned to build these facilities and eventually expand ferrochrome production capacity to about 50,000 to 60,000 tons per year.

Copper.—The industry met planned annual goals. Official sources indicated a 7.9% production increase, but did not state whether the increase was for the whole industry or for mine production only. Reportedly, the Gjegjan Mine in the Kukes District exceeded the annual production plan by 1,400 tons with total production exceeding 250,000 tons of ore. In the same district, a new copper mine was under development and was planned for startup in 1984. The expansion of existing mining facilities was also underway. Technical improvements at the country's beneficiation plants have increased the copper content in concentrates produced from low-grade ores to 20% to 25%, from past levels of 16% to 17%. Construction work was reportedly continued at copper concentrators at Reshen, Reps, and Fushë-Arrëz

Iron Ore.—Developments in the iron mining industry, which produces a nickeliferous laterite ore, included the modernization of the Prrenjas Mine, which resulted in an 80% mechanization of the mining operations. By 1985, new galleries were to be opened and production doubled.

Iron and Steel.—Albania reported a 29% increase in steel production for the year at the Elbasan steelworks; the increase, however, was from a low production base. Steelmaking capacity at Elbasan was below 100,000 tons per year. During the year, a new nickel production line was put into operation at Elbasan.

MINERAL FUELS

Albania continued to be a net exporter of electric power and petroleum products. Approximately 80% of domestic energy came from hydroelectric power with residual requirements supplied by domestic coal and hydrocarbon deposits.

Coal.—The coal (lignite) production plan was met, with mined coal output increasing 3.4% over that of 1982. The production plan for 1984 called for a further 15.5% increase. Albanian lignite was consumed mainly by the country's powerplants and heavy industries.

Petroleum and Natural Gas.—Shortfalls in meeting planned production increases for the industry continued from 1982. This, reportedly, was again due to dated technology, faulty drilling, imprecise documentation, and inadequate geological studies.

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[1] Foreign mineral specialist, Division of Foreign Data.

The Mineral Industry of Algeria

By Peter J. Clarke[1]

Algeria's relatively diverse mineral industry contributed approximately $12.5 billion to the 1983 gross domestic product estimated at $46 billion.[2] Oil revenues, including revenues from natural gas exports, accounted for 95% of the mineral industry's total revenue, 85% of total exports, and 58% of Government revenues. Although oil and gas were Algeria's most important commodities to world trade, several other minerals made a noticeable contribution to the domestic economy, including iron ore, steel, fertilizer materials, phosphate rock, cement, lead and zinc, and mercury.

The hydrocarbon sector continued to be the mainstay of the economy. Although other members of the Organization of Petroleum Exporting Countries (OPEC) were suffering from sharply reduced revenues from the March 1983 reduction in the price of oil, Algeria's diversified hydrocarbon industry, which produces more natural gas, condensate, and refined products individually than crude oil, was able to prevent a significant fall in revenues. Total petroleum revenues were at about the same levels as in 1982, between $11.8 and $12 billion, with crude oil accounting for only 30% of these revenues, and the rest coming from exports of natural gas, liquefied natural gas (LNG), liquefied petroleum gas (LPG), condensate, and refined petroleum products. Algeria had the fourth largest reserves of natural gas in the world and ranked seventh in world production.

Algeria's 1980-84 development plan was intended to utilize petroleum revenues to expand the public services sector after several years of emphasizing heavy industries, such as petroleum, steel, gas processing, and construction materials. Development of the country's industry has been undertaken mostly by state-owned corporations, the largest of which was the Société pour la Recherche, la Production, le Transport, la Transformation, et la Commercialisation des Hydrocarbures (SONATRACH), the Government petroleum company. Part of the new development plan involved breaking up SONATRACH into four oil service companies responsible for production, oilfield services, geophysics, and exploration. The state companies responsible for nonfuel mineral development were Société Nationale de Siderurgie (SNS) for iron and steel, and Société Nationale de Recherches et d'Exploitations Minières (SONAREM) for most other minerals. Expansion of these companies' operations was receiving lower priority than the development of housing, communications, education, and community development, which together were allocated 52% of the development budget, while industry was to receive only 4% of the budget. Total Government expenditures, divided almost evenly between the administrative budget and the development budget, reached $20.6 billion in 1983.

PRODUCTION AND TRADE

Algerian natural gas production rose to its highest level ever in 1983, increasing 15% over the 1982 level. Utilization of natural gas increased even more, 57% over that of 1982, as new gas-gathering projects were implemented in several major gas and condensate fields, including Hassi R'Mel and Hassi Messaoud. The increase in the production of natural gas provided a timely substitute for crude oil at a time when the price for oil was declining in real and nominal terms. Algeria was able to switch from oil to predominantly gas-based exports, to take advantage of the consuming nations' switch to gas, and of a market not regulated by OPEC. Crude oil production between 1980 and 1983 has fallen more than 30%, while production of condensate during the same period increased almost 200%. Although associated gas production has fallen in line with crude oil output, nonassociated gas production was up over 150%. At the same time, flaring of associated gas was down more than 50%. LNG production was up over 160% since 1980, and LPG production was up almost 200%.[3]

Other commodities that registered significant production increases were refined petroleum products, where capacity has also risen significantly in the past several years; iron ore; and cement, where the Government was striving to raise domestic production enough to alleviate the need for imports. Production of most metals remained stable in 1983.

Exports were also dominated by hydrocarbons, where total oil and gas exports were valued at nearly $12 billion, representing 85% of total exports value. Exports of crude oil declined 6%, while exports of condensate increased 7%. LNG exports rose 56% from those of 1982, marking the largest increase for any commodity. Algeria's primary trading partners continued to be France, Italy, the Federal Republic of Germany, Belgium, and the United States, mostly by virtue of its gas trade. Algeria continued to have a nearly $1 billion trade surplus, with its import level holding at $11 billion. Imports consisted mostly of industrial equipment and supplies, and food products.

Table 1.—Algeria: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Cadmium, refined[e]	[3]64	60	65	65	65
Copper concentrate:					
Gross weight	870	1,048	688	627	600
Metal content	200	240	158	144	130
Iron and steel:					
Iron ore, gross weight thousand tons	2,864	3,454	3,480	3,705	4,200
Metal:					
Pig iron do	[r]497	[r]669	897	[r][e]900	950
Steel, crude do	[r]315	[r]384	522	[e]575	600
Lead, metal content of concentrate	2,200	1,800	5,100	4,900	[3]6,000
Mercury 76-pound flasks	14,719	24,403	[e]25,000	[r][e]11,000	10,000
Silver[e] thousand troy ounces	100	100	110	110	120
Zinc:					
Concentrate, metal content	[r]8,800	[r]15,400	20,000	22,000	[3]21,600
Smelter	27,300	[e]30,000	31,000	31,000	[3]31,100
NONMETALS					
Barite, crude	102,513	98,255	89,000	102,000	110,000
Cement, hydraulic thousand tons	3,768	4,156	4,460	[r][e]5,000	5,500
Clays:					
Bentonite	34,892	[r]34,620	[r][e]35,000	[r][e]35,000	35,000
Fuller's earth	5,000	5,000	5,100	5,100	5,000
Kaolin	[r]16,302	8,251	[e]19,000	[e]15,000	17,000
Diatomite	[r]4,341	[r]4,093	[e]4,500	[e]4,500	4,500
Gypsum and plaster[e] [4] thousand tons	[3]191	200	200	200	250
Lime, hydraulic[e] do	[4]38	40	40	40	40
Nitrogen: N content of ammonia	20,865	29,937	39,900	164,000	[3]131,500
Phosphate rock thousand tons	1,084	1,025	916	947	[3]893
Salt do	162	154	128	[r][e]140	150
Sodium compounds: Caustic soda[e]	700	700	700	700	700
Strontium minerals: Celestite, gross weight	5,400	5,400	5,400	5,400	5,400

See footnotes at end of table.

Table 1.—Algeria: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Sulfur, elemental[e]	15,000	14,000	15,000	10,000	15,000
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural:					
Gross million cubic feet	1,539,006	1,497,511	1,613,873	2,897,731	[3]3,332,029
Marketed (including liquefied) do.	516,023	411,414	466,151	1,048,276	[3]1,650,211
Natural gas plant liquids (condensate)[e] thousand 42-gallon barrels	33,872	[r]68,168	[r]78,252	[r]104,839	[3]179,675
Petroleum:					
Crude do.	421,121	361,599	294,850	257,325	[3]251,850
Refinery products:					
Asphalt do.	NA	NA	511	694	700
Gasoline do.	11,315	9,516	12,483	12,155	12,500
Jet fuel and kerosine do.	4,380	3,294	4,380	4,891	5,000
Distillate fuel oil do.	16,790	26,352	33,763	51,246	52,000
Residual fuel oil do.	12,775	[r]18,375	24,930	35,697	36,000
Liquefied petroleum gas do.	NA	NA	5,256	6,497	7,000
Lubricants do.	365	732	365	292	350
Naphtha do.	10,220	21,594	21,864	34,602	37,000
Refinery fuel and losses do.	2,555	3,294	NA	NA	NA
Total do.	58,400	[r]83,157	103,552	146,074	150,550

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through July 1, 1984.

[2] In addition to the commodities listed, secondary aluminum, secondary lead, and secondary copper may be produced in small quantities; crude construction materials, presumably are produced for local consumption, but output is not reported and available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

[4] Includes approximately 50,000 tons of plaster each year.

COMMODITY REVIEW

METALS

Iron Ore.—Production of iron ore increased sharply to over 4 million tons, as output from mines in the Tebessa region continued to expand. Iron ore was produced from three mines near Tebessa, on the Mediterranean coast in northeastern Algeria: Ouenza, Boukhadra, and Khanguet, with Ouenza providing the bulk of production, over 2.5 million tons, and Boukhadra supplying about 1 million tons. Reserves at all the mines were estimated at 120 million tons of siderite and hematite ore, containing between 50% and 64% iron. Two other smaller iron ore mines were located around Beni Saf in northwestern Algeria. These mines were reopened in the mid-1970's, but continued to supply only a small fraction of Algeria's output.

A much larger iron ore deposit was being considered for development at Gara Djebilit, 130 kilometers southeast of Tindouf. Reserves at this deposit were estimated at 800 million tons containing 57% to 58% iron and 0.8% phosphorus. Algerian geologists were evaluating the deposit in 1983, but exploration was still questionable because of its location near the border with the disputed Western Sahara region in Morocco. Development of the deposit would also require a large investment in infrastructure, including an ore transportation railroad for the remote location.

Iron and Steel.—Algeria's main steel complex was the El Hadjar Iron and Steel Works, 15 kilometers south of Annaba, the largest port in eastern Algeria, and 150 kilometers from the iron ore mines at Ouenza. The complex was owned and operated by SNS. Capacity of the plant was recently expanded from 400,000 to 1.8 million tons per year of raw steel. Along with the increased steel capacity, a cokemaking facility was added, as was a large rod and bar mill, and a 1,000-ton-per-hour coal-handling facility. SNS was planning to upgrade the plant further by installing a continuous caster.

SNS's growth plan for the country's steel industry involved construction of 2.3-million-ton-per-year, direct-reduction-based steel plant at El Milia. Nippon Steel Corp. of Japan was the consultant for the project, and Brazil had already agreed to supply pellets for the plant. The complex was to consist of a 2.3-million-ton-per-year direct-reduction plant, eight 150-ton electric arc furnaces, along with blooming and billet mills. Startup of the project was scheduled for 1987, and preparation of the plantsite began in 1983. This plant was intended to supply a planned 900,000-ton-per-year rerolling plant at Moulayslisse.

Lead and Zinc.—Lead and zinc ore was produced in 1983 from two mines in Algeria, the older El Abed Mine, opened in 1952, with a 750-ton-per-day milling capacity, and the newer Kherzet-Youcef Mine, which began operating in 1980. Small amounts of lead-zinc ore were produced from a third mine at D'ain Barbar. The El Abed Mine produced the bulk of the output. The El Abed deposit was part of the large Bou Beker-Touissit ore body, which runs from near Oudja, Morocco, to just over the Algerian border near Tlemcen. Minable ore reserves at El Abed were estimated at 400,000 tons of zinc metal and 70,000 tons of lead metal in ore grading 5% zinc and 1.2% lead. All of Algeria's lead-zinc mines were operated by SONAREM.

Mercury.—Algeria also produced significant quantities of mercury in 1983 from two mines about 80 kilometers west-southwest of Annaba in the northeast corner of Algeria. Cinnabar and meta-cinnabar ore was mined from the M'Rasma Mine and the Ismail Mine, 8 kilometers apart. Mercury was produced from an Italian-designed, multiple-hearth furnace at Azzaba, which was installed in 1971. Minable ore reserves at M'Rasma were estimated at 236,000 tons of ore containing 1.3% mercury, with locally higher concentrations of up to 7% mercury. Reserves at Ismail were estimated at 200,000 tons of ore containing 0.5% mercury. Production of mercury has declined in recent years owing to a reduction in ore grade as the higher grade material at both deposits was mined out and the resulting lower efficiency of the furnace. Mercury production in Algeria peaked in 1970 at about 31,000 flasks.

NONMETALS

Cement.—Output of cement in Algeria increased again in 1983 as the 1-million-ton-per-year Sour El Ghozlane plant began operating in mid-1983. SA Cimenteries CBR of Belgium was the consulting engineer for the project, and F. L. Smidth of France performed the construction. Cement consumption in Algeria still exceeded domestic production capacity by almost 3 million tons, but Algerian authorities were hoping to raise capacity to over 10 million tons by the middle of the decade.

Fertilizer Materials.—*Nitrogenous.*—Nitrogenous fertilizer was produced at SONATRACH's Arzew facility on the Mediterranean coast in northwestern Algeria, while construction of a second ammonia plant in the northeast corner of the country was nearing completion. At Arzew, facilities consisted of a 272,000-ton-per-year ammonia production plant utilizing natural gas feedstock, a 330,000-ton-per-year ammonium nitrate facility, and a 120,000-ton-per-year nitric acid unit. Production from the plant, built in two stages by Creusot Loire S.A. and Technip, both of France, and Voest-Alpine AG of Austria, in 1966 and 1974, has never reached full capacity. Creusot Loire undertook plant renovations in 1978 to raise capacity utilization, and production was halted in 1979 and then restarted in 1982. The rehabilitation project was expected to be completed in 1984.

Meanwhile, Creusot Loire and M. W. Kellogg Co. of the United States were constructing a second ammonia plant, a 1,000-ton-per-day facility at Annaba, site of the country's phosphatic fertilizer plant. The plant was scheduled to go on-stream early in 1984.

Phosphate Rock.—Algeria's only significant phosphate producing mine was at Djebel Onk near the Tunisian border in northeastern Algeria, although a smaller phosphate mine was in operation at Kouif mainly to maintain local employment. Capacity of Djebel Onk was 2.4 million tons per year of raw phosphate rock with a 53.8% bone phosphate of lime (BPL) content. Production from the open pit mine was beneficiated by crushing, screening, and desliming to obtain a maximum of 1.45 million tons of 62.5% BPL concentrate in a first stage. Calcination then raised the BPL content to 69.5%, and further processing by continuous carbonation was employed to raise the grade to 75.5% BPL. The material was then dried in rotary kilns. Total reserves at Djebel Onk were estimated at 300 million tons of phosphate rock. SONAREM was the owner and operator of the mine and mill. A third mine, at Mzaita, which operated between the late 1800's and 1958, was being considered for recommissioning.

Phosphatic Fertilizer.—Domestic phosphate rock production was consumed in Algeria's only phosphatic fertilizer plant at Annaba. Capacity of the plant, which began operating in 1972, was 200,000 tons per year of triple superphosphate, 125,000 tons per year of diammonium phosphate, 180,000 tons per year of phosphoric acid, 540,000 tons per year of sulfuric acid, 150,000 tons per year of nitrogen-phosphorus-potassium fertilizer, and 75,000 tons per year of mixed nitrogen-phosphorus fertilizer. A 46,000-ton-per-year tripoly phosphate unit was added in 1978. A second phosphatic fertilizer complex planned for Tebessa, near the Djebel Onk phosphate mine, was canceled in 1983, while efforts were to be made to bring the Annaba facility up to capacity. Algeria still imported close to 75% of its fertilizer requirements, which demonstrated the need for the country to improve the efficiency of the existing facilities.

MINERAL FUELS

It was a mixed year for Algeria's hydrocarbon industry in 1983, with the highlights being the commissioning of the world's first intercontinental undersea gas pipeline linking Algeria to Italy, and a 57% increase in the production of marketable natural gas. Problems that persisted into the year, however, included unsatisfactory operation and maintenance of the country's two main gas liquefaction plants, which continued to operate far below capacity, and major contract difficulties with the consumers of Algerian natural gas, which in one case resulted in unilateral suspension of a long-term contract.

Natural Gas.—*Production.*—Algeria's future role in the world's energy market was clearly established as a gas producer. Proven reserves of natural gas, at over 110 trillion cubic feet, were the fourth largest in the world, behind the Soviet Union, Iran, and Saudi Arabia. More than one-half of Algeria's 1983 natural gas production of over 3.3 trillion cubic feet was reinjected. Of the total gas produced, only about 12% was produced in association with crude oil, the rest being nonassociated gas. About 450 million cubic feet per day of gas was flared, although gas-gathering projects at the Oued Noumer and Hassi Messaoud Oilfields and the Rourde-Nouss condensate field were to increase the percentage of gas production that is ultimately used for exports and industry.

The largest share of Algeria's gas production was derived from the Hassi Messaoud, Hassi R'Mel, Rhourde-Nouss, and Rhourde-Adra oil and gas fields. Sofregaz of France was constructing a gas-gathering system at the Hassi Messaoud Oilfield, traditionally the largest oil producing field in the country, and Snamprogetti S.p.A. of Italy was constructing similar facilities at the Rhourde-Nouss and Rhourde-Adra gas-condensate fields. Gas recovery at Hassi Messaoud was to increase 300 million cubic feet per day, while Snamprogetti's treatment center at Rhourde-Nouss would be capable of processing 1.5 billion cubic feet per day of gas to produce 400 million cubic feet per day of dry gas, 3.5 million tons of condensate, and 800,000 tons of LPG annually. The condensate and LPG were intended for export.

Processing.—Algeria's gas processing industries continued to expand, despite problems at some of the existing facilities. The two major gas liquefaction plants, SONATRACH's LNG-1 and LNG-2 at Arzew, shut down intermittently in 1983 for repair and maintenance, resulting in overall capacity utilization of below 60%. LNG-2 was brought on-stream in 1982, raising total LNG export capacity to 1.06 trillion cubic feet per year. Operating LNG plants were the Camel four-train plant at Arzew with 52 billion cubic feet per year total capacity; LNG-1 and LNG-2, each capable of producing 325 billion cubic feet per year; and the six-train, 325-billion-cubic-feet-per-year plant at Skikda. LNG-3, planned in 1979 for Arzew, was canceled in 1980 by Algerian authorities. Algeria's major LNG customers in 1983 were France, Spain, the United States, Italy, and Belgium.

Production capacity of LPG was also expanding as new facilities were brought on-stream. Four new LPG production units at the Arzew LPG facility commenced operating, raising LPG production capacity from 2.3 to 4 million tons per year. LPG was also produced in Algeria's three largest petroleum refineries, and from an extraction plant at Skikda. LPG was being emphasized as an export product as opposed to LNG because of the need for tanker transportation and regasification facilities for LNG; whereas, cheaper pipelines were the dominant form of LPG transportation.

In 1983, SONATRACH was involved in negotiations and/or disputes with three of its major purchasers of LNG: Distrigaz SA of Belgium, Empresa Nacional del Gas S.A. (Enagas) of Spain, and Trunkline LNG Co., a subsidiary of Panhandle Eastern Corp., of the United States. All had negotiated high-volume contracts—Enagas and Trunkline in the mid-1970's and Distrigaz in the early 1980's—at a time when the price of oil and gas was expected to move significantly higher. Distrigaz was negotiating with SONATRACH to reduce its contract obligation from 88 billion cubic feet per year to one-half that level because of an excess supply. Enagas was attempting to reduce its contractural obligation from 157 billion cubic feet per year, all on a take-or-pay basis, to about 50 billion cubic feet per year. Trunkline, after having its initial 1975 contract of 157 billion cubic feet per year reduced to 60% of that level in 1977, unilaterally suspended purchases of Algerian gas for an indefinite period because the high cost of that gas had put the company in danger of pricing itself out of the southeastern U.S. market. On the positive side, Tunisia agreed to import additional Algerian LPG and LNG by increasing its take from the Trans-Mediterranean (Transmed) pipeline system that passes through Tunisia.

Pipelines.—Pipeline projects were dominated by the completion of the 2,500-kilometer Transmed pipeline linking the gasfields in northern Algeria to the industrial areas of northern Italy. The single 48-inch line crosses Tunisia to the Mediterranean coast, where it splits into three 20-inch lines for the 160-kilometer crossing from Cape Bon in Tunisia to Sicily. The line rejoins for a 360-kilometer section across Sicily, and splits again for the undersea trip to Calabria in southern Italy. The northern terminus of the line was in Minerbio, north of Rome. Total pipeline capacity was 425 billion cubic feet per year of gas, deliveries of which began in June 1983, at just slightly below capacity.

In addition to the Transmed pipeline completion, a sixth pipeline linking the Sahara Desert gasfields to the Port of Arzew was completed by Bechtel Corp. of the United States. The 24-inch-diameter, 510-kilometer pipeline was capable of transporting 6 million tons of LPG annually from the Hassi R'Mel Gasfield and fractionation plant to Arzew. Other pipeline projects being undertaken by SONATRACH were a 1,000-kilometer line from the Alrar Gasfield to Hassi R'Mel, and a 315-kilometer line from Hassi Messaoud to Hassi R'Mel.

Petroleum.—*Crude.*—Crude oil production continued its 5-year decline, falling to an average 690,000 barrels per day from 705,000 barrels per day in 1982. Overall crude production has fallen 41% since 1978. Just as gas production had taken the place of oil as the dominant commodity, refined product exports were nearly double those of crude by 1983. Crude exports were approximately 68 million barrels, compared with about 132 million barrels of refined products. Crude oil was produced from more than 40 oilfields in Algeria, and remaining proven oil reserves in the country, estimated at 92 billion barrels, would last 30 years at the past 5 years' average rate of production.

Refined.—Algeria's four petroleum refineries, all of which were operated by SONATRACH, had a total crude capacity of about 150 million barrels per year. The refineries were located at Arzew, Hassi Messaoud, Skikda, and Algiers. SONATRACH was planning a new 90,000-barrel-per-day refinery for Saida, which was in the engineering stage in 1983. Completion was not expected until 1986-87. Algeria continued to emphasize production of refined products, condensate, and natural gas, the prices for which were not regulated by OPEC, as a substitute for crude oil.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Algerian dinars (DA) to U.S. dollars at the rate of DA4.79=US$1.00.

[3] Petroleum Economist (London). July 1983, p. 259.

The Mineral Industry of Angola

By George A. Morgan[1]

In 1983, mining industry activity was predominantly in the established diamond mining areas of Lunda Norte Province and offshore Angola's Cabinda Enclave for petroleum. Crude oil output increased owing to the realization of a gas reinjection plan in Cabinda and the startup of oil production from a new oilfield, also in Cabinda. Improved security and training at the diamond sites was underway after 2 years of poor performance.

Despite the general paucity of information regarding the mining industry, published reports indicated a deterioration of cement, iron ore, and salt facilities, and transportation was inefficient or even nonexistent in most areas outside of Luanda and Cabinda. Migration of people dislocated by the continuing civil strife and by poor working conditions in the coastal towns impacted output. Expenditures for defense consumed 40% of Angola's foreign exchange earnings.

Financing for the petroleum and gas industry was from the Export-Import Bank of the United States, Lloyds Bank of London, and commercial banking institutions in the United States and Europe such as Chase Manhattan Bank and Morgan Guaranty and Trust Co. A $45 million loan was extended to the Angolan Government and Cabinda Gulf Oil Co. by the Export-Import Bank to develop phase three of the Takula Oilfield in Cabinda.[2] Total project cost was $589 million. U.S. suppliers would provide construction, installation, and drilling services, as well as steel casing, tubing, structural components, and oilfield production equipment. Interest charged on the loan was 10%, to be repaid in 16 semiannual installations beginning June 1987.

PRODUCTION AND TRADE

Reliable production and trade data were unavailable. Production levels were estimated on the basis of best available information. Angola emphasized development of its oil and gas industry, where production was concentrated in the extreme northwest of the country and offshore the Cabinda Enclave.

Revenues from oil were about $1.5 billion and were 40% of export earnings. The United States imported commodities valued at $911.4 million from Angola, mainly oil, and exported materials valued at $91 million to Angola, mainly equipment and structural components.

Table 1.—Angola: Production of mineral commodities[1]

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Iron and steel: Steel, crude[e] metric tons	10,000	10,000	10,000	10,000	10,000
NONMETALS					
Cement, hydraulic thousand tons	400	240	250	250	220
Diamond:					
Gem[e] thousand carats	630	[r]1,110	[r]1,050	[r]915	775
Industrial[e] do	[r]211	[r]370	[r]350	[r]310	259
Total do	[r]841	[r]1,480	1,400	1,225	1,034
Gypsum[e] metric tons	25,000	25,000	20,000	20,000	20,000
Salt[e] do	50,000	50,000	50,000	[r]58,000	55,000
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural[e] do	25,000	25,000	25,000	25,000	25,000
Gas, natural:[e]					
Gross million cubic feet	48,600	58,000	55,000	52,000	55,000
Marketable do	2,500	2,500	2,500	2,500	2,500
Petroleum:					
Crude thousand 42-gallon barrels	49,640	55,034	[e]52,000	50,700	58,400
Refinery products:					
Gasoline do	[e]500	NA	NA	720	NA
Jet fuel do	[e]450			NA	
Kerosine do	[e]160			NA	
Distillate fuel oil do	[e]1,500			NA	
Residual fuel oil do	[e]3,700			NA	
Other do	[e]150			150	
Refinery fuel and losses do	[e]300			NA	
Total do	[e]6,760	NA	NA	[e]7,240	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through May 29, 1984.

[2]In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and broken stone) presumably is produced for local consumption, but information is inadequate to make reliable estimates of output levels.

COMMODITY REVIEW

METALS

There was limited activity in the metals area of the mining industry. Reference was again made to exploiting iron ore at Cassinga, but civil disturbances continued to prevent restarting of a viable project.

NONMETALS

Cement.—A cement shortage was reported owing to limited output by Empresa de Cimentos de Angola (CIMANGOLA) and to shipping difficulties in local distribution. Output was only about 600 tons per day, all used domestically. Angola has not exported cement since 1980. Installation of a new kiln to double production has been pending for 10 years. A new pier to facilitate CIMANGOLA's shipments for internal distribution also has been pending.

Diamond.—Output declined for the third consecutive year owing to limited foreign exchange, delays in receipt of spare parts and machinery, and labor force difficulties. New measures were taken to counter theft and illegal diamond trafficking, which had become a serious problem.

Diamond production was by Companhia de Diamantes de Angola (DIAMANG). DIAMANG's shareholders were Empresa Nacional de Diamantes de Angola, 77.21%; Société Générale de Belgique, 11.49%; Société d' Enterprise et d'Investissement S.A., 5.95%; Diamond Corp. Ltd., 1.67%; Morgan Guaranty and Trust, 1.11%; Soloman R. Guggenheim Foundation, 0.74%; John S. G. Memorial Foundation, 0.64%; Pacific T. Consolidated Corp., 0.61%; Compagnie de Gestion et de Banque, 0.24%; Daniel F. Guggenheim Foundation, 0.15%; Société de Banques Suisses, 0.11%; and Swiss Bank Corp., 0.08%.

Mining in the 50,000-square-kilometer concession of Lunda Province was from three centers with an operations center at Dundo. Output from the three centers was as follows: Lucapa, 443,000 carats; Cuango, 296,000 carats; and Andrada, 295,000 carats. Cretaceous age deposits mined included riverbeds, alluvial flats, terrace and eluvial deposits, and weathered surface exposures of kimberlites. Thin lenses of high-grade material were also found in secondary deposits called "calonda," which consisted of conglomerates and sandstones.

Processing involved four stages: (1) pretreatment by washing and screening, (2) concentration of screen product by heavy-medium separation using ferrosilicon or magnetite, (3) diamond recovery from concentrates using greased belts or X-ray fluorescence, and (4) manual selection. Treatment plants for the first two stages were located at most minesites. For the final two stages, concentrates were shipped to two sort houses, one each in the Andrada and Cuango areas. A new sort house was under construction for the Lucana area.

Total employment comprised 17,000 workers, including 7,500 in the engineering division, 1,500 in the metallurgy division, 400 in the prospecting and geology division, and the remainder in mining. About 800 were expatriates, mainly Portuguese and British. Over 600 pieces of equipment and plant were serviced under contract by Intraco. Mining assistance was by Mining and Technical Services Ltd. of the United Kingdom. Air transport between Luanda and Dundo was by Transamerica on a 24-hour-per-day, 7-day-per-week basis.

Energy for the operation was from four 2-megawatt hydroelectric generators at Luaximo, near Dundo, a 1.6-megawatt diesel power station at Luxilo, and a 6.2-megawatt thermal station at Lucapa.

Diamond marketing was by the Central Selling Organization. Gem diamond sales were valued at over $200 million in 1980, and $150 million in 1982. In 1983, diamond prices averaged $91 per carat.

Salt.—A new organization was created in the Ministry of Fisheries, which was to be responsible for all salt production in Angola. Output had been through private entities and the Ministry of Industry.

A study conducted by Cuba indicated that rudimentary and out-of-date salt production and processing techniques were in use in Angola, and concluded that the southern coastal areas should be exploited more effectively for salt.

About 28 saltworks were distributed over the northern, southern, and central coastal zones. Purification plants were only in the central zone. A large number of saltpans were reported destroyed owing to abandonment by workers because of poor working conditions. Antiquated equipment, poor maintenance, lack of organization, transportation, and capital over an extended period of time were cited as the causes. In the vicinity of Benguela, two salt plants and three evaporation pans were inactive.

MINERAL FUELS

Petroleum output increased with implementation of enhanced oil recovery technology in the Cabinda Enclave and startup of the Takula Oilfield, also offshore Cabinda. Exports by Sociedade Nacional de Combustiveis de Angola (SONANGOL), amounting to 92,000 barrels per day, were reported to be distributed as follows: Europe, 45.7%; the United States, 32.0%; Japan, 10.9%, with 10,000 barrels per day to Mitsubishi Petroleum Development Co. Ltd.; and Brazil,10.9%; with 10,000 barrels per day to Petróleo Brasileiro S.A.

Several fields were being readied for production, including the Numbi Oilfield in Cabinda Enclave, and Palanca in Block 3, offshore the northern coastal area. Oil exploration offshore in Block 1 resulted in discovery of oil at the Pitangueira 1 oil rig, 47 kilometers from the coast in 93 meters of water. Flow rate was 4,600 barrels per day. An Italian company was the principal operator in Block 1, as part of a contract signed with SONANGOL. The Italian company had 50%; France, 25%; and Petrogal, 10%. In Block 3, operated by Société National Elf Aquitaine Angola, an oil flow of 3,000 barrels per day in 87 meters of water at the Veado Um well was reported. The discovery was among five successful strikes in Block 3.

The Government sought to increase its participation in the crude oil refinery at Luanda from 33% to 60%. Petrofina was the major shareholder, and continued to supply technical aid to the refinery. A recent study concluded that expansion of the refinery was not feasible. About 7.2 million barrels of refined products were produced annually from domestic crude.

Construction of a gas tank at Namibe and storage facilities at Porto Amboim, Huambo, and Lobito were underway. A gas tank at Lobito and storage facilities at Malanje were operational. Various stages of the major service and supply center at Kwanda, 5 kilometers from Soyo in Zaire Province, were completed, including dredging of the Pululu Channel. Further expansion was planned to accommodate additional oil output.

Fuel supplies to Malange, about 400 kilometers east of Luanda, by SONANGOL were reported to be irregular. Traffic on the main railroad trunk line was halted and tanker trucks were being used to move fuel from Cacuso to Malange, a distance of about 75 kilometers.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been estimated to be convertible from Angolan kwanza to U.S. dollars at the rate of 30.214 kwanza=US$1.00 for 1982 and 1983.

The Mineral Industry of Argentina

By Pablo Velasco[1]

Mineral industry output increased modestly compared with that of 1982. Actual mineral production, which includes mineral fuels, was up 2.25% of gross domestic product (GDP) over that of 1982. Petroleum and gas production exhibited increases owing to lengthy renegotiation agreements with Yacimientos Petrolíferos Fiscales (YPF) and Gas del Estado contractors. Exports of minerals, metallics, nonmetallics, and mineral products decreased 30% in volume and 25% in value, respectively, compared with those of 1982. Argentina exported 197,000 tons of minerals for a total value of $35.6 million. The principal export minerals, in order of importance, were lead concentrates, borates, boric acid, cement, and tin and silver concentrates.

Coal production declined 6% because of a decrease in demand by the steel industry and thermal electrical plants. The aluminum industry output declined 2%, compared with 1982 output, and apparent consumption increased by 19% owing to demand increasing mainly in the manufacturing sector. The most likely copper deposit that could be developed is Bajo la Alumbrera in Catamarca Province.

Crude steel output increased slightly, by an estimated 1% compared with 1982 output. An estimated 60% of installed capacity was in use. Production of lead and zinc increased 6% and 2%, respectively, while that of silver decreased 2%, compared with that of 1982.

Nuclear power capacity remained unchanged with only the Atucha I nuclear reactor in operation. The second nuclear reactor, the Embalse in Río Tercero, Córdoba Province, was inaugurated May 5, 1983, and was initially to operate at 5% of the 600-megawatt capacity. Production of uranium increased 7%, compared with 1982 output.

The Argentine economy, depressed for the past several years, has been experiencing a modest economic growth since the second half of 1982. During 1983, Argentina's GDP increased 2.8% to $27.1 billion[2] at constant 1970 prices. GDP percentages at current prices were not reported by the Central Bank of Argentina, because they would reflect a monetary impact rather than a current change in the economy. The inflation rate in 1983 reached 433.7%, the highest inflation rate in the country since 1976 and also the highest in the world. The inflation rate was caused by generous wage policies and loss of control of the fiscal deficit. Preliminary 1983 figures indicated that Argentina's trade balance exceeded the targeted $3.0 billion trade surplus. Argentina's economic policymakers adjusted the exchange rate as declared, at roughly the same rate as domestic inflation. The total value of exports was estimated at $7.7 billion, and imports, at $4.2 billion. The Central Bank of Argentina issued new currency that has four zeros less than the old one. Thus, one new Argentine peso is equivalent to 10,000 of the old denomination.

Economic growth was led by the manufacturing sector with a 9.9% growth of GDP compared with that of 1982, followed by electrical power, gas, and water, 8.0%; wholesale and retail trade, 3.6%; transportation, storage, and communication, 2.8%; and mining and quarrying, 2.2%. The construction industry remained deeply depressed, falling another 6.8% below that of 1982 owing to a severe drop in domestic demand for industrial materials.

Government Policies and Programs.— After 7 years of military rule, the current Government, which entered office on July 1, 1983, was preparing to transfer authority from the military to a civilian government. General elections were held on October 30, and the new civil government was to assume power on January 30, 1984.

In 1982, the second consecutive year of recession and high inflation, the shortage of foreign exchange led the authorities to request a rescheduling of foreign debt and to seek substantial financial support from the International Monetary Fund (IMF), the Bank for International Settlements, as well as international creditor banks.

Economic policies were formulated in the Declaration of Intent to the IMF signed on January 7. Among the stated goals were the elimination of financial arrears to foreign creditors and a reduction in inflation to 160%. However, the rate of price increases during the year made the achievement of this target unlikely. Restrictions on both foreign currency transfers and imports continued to be eased throughout the year, and export subsidies were reduced.

Economic activity was stimulated with a view to achieving real GDP growth of 5% during the year, following falls of almost 6% in both 1981 and 1982. Implementation of economic austerity measures was made difficult by the forthcoming elections and by mounting pressure from the trade unions.

The country's foreign debt at yearend stood at $43.6 billion, up from the $35 billion estimated in August. A number of measures designed to reactivate the economy had been imposed in the first week of January. These included a reduction in export taxes on agricultural products, an amnesty for undeclared funds in the construction industry, and an increase in monthly interest rates, from 9% to 11.5% for borrowers and from 8.5% to 10.5% for depositors.

In an effort to rationalize mining policy and development, representatives of Argentina's 22 Provinces have agreed to establish a new Mining Federal Council. The new Minister of Mines of the nation welcomed the dissemination of mining policy powers to the regions and also called for changes in the nation's Mining Code, which gave too much power to the central Government. Other main elements in the redirection of mineral industry policy were more emphasis on responding to real market needs; better revaluation of the country's resource base; vertical integration of resource-based industry; upgrading the competence of local consultants; and a greater participation by the private sector companies, assisted by the proposed Mining Bank.

PRODUCTION

Mining output continued to be dominated by nonmetallics and industrial minerals, but less than in 1982. Mine production of metallic ores and concentrates declined an estimated 5%, nonmetallic minerals fell 7%, and construction materials increased by 3% compared with 1982 output. In the metallic group, production was led in volume by iron ore, followed by zinc, lead, manganese, uranium, tin, copper, and gold; however, with the exception of silver, output in all of these increased compared with that of 1982.

Aluminum production declined 2% compared with 1982 output. The aluminum plants were running at 90% of capacity, using bauxite imported from Australia. At yearend, an increase in domestic consumption was noted with greater demand also from the manufacturers' sector. Production of ferroalloys decreased owing to the depressed economy, while that of iron ore, crude steel, and cement increased. However, production of crude oil and marketed natural gas went up 0.03% and 3%, respectively. Production of uranium increased 7% and coal production fell 6%, compared with 1982 output.

Table 1.—Argentina: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum:					
Primary	118,400	133,100	133,900	137,600	135,000
Secondary[e]	[r]9,800	7,000	[r]5,000	6,000	7,000
Beryllium: Beryl concentrate:					
Gross weight	12	31	7	6	7
BeO content	1	3	1	1	1
Bismuth kilograms	--	NA	NA	NA	NA
Cadmium: Smelter	36	18	--	21	19
Chromium: Chromite, gross weight	165	169	NA	NA	NA
Columbium-tantalum concentrates, gross weight: Columbite kilograms	1,918	NA	NA	NA	NA
Copper: Mine output, metal content	89	182	80	38	235
Gold, mine output, metal content troy ounces	10,140	10,622	14,757	20,319	20,898
Iron and steel:					
Iron ore and concentrate, gross weight thousand tons	611	437	398	587	629
Metal:					
Pig iron and sponge iron do.	1,938	1,793	1,720	1,896	1,871
Ferroalloys, electric furnace:					
Ferromanganese	34,373	23,234	22,423	23,546	23,000
Silicomanganese	15,271	11,835	12,779	15,679	15,000
Ferrosilicon	13,915	11,781	10,286	9,572	9,000
Other	2,327	2,226	2,771	9,676	9,000
Total	65,886	49,076	48,259	58,473	56,000
Steel, crude thousand tons	3,203	[r]2,685	2,526	2,913	2,930
Semimanufactures[3] do.	3,010	2,643	2,193	2,667	2,814
Lead:					
Mine output, metal content	31,775	32,606	32,652	30,115	32,000
Metal:					
Smelter, primary[e]	[r]32,000	23,200	19,000	[r]17,000	16,000
Refined:					
Primary	32,000	23,200	19,000	17,000	16,000
Secondary	18,000	18,500	15,600	14,600	14,000
Total	50,000	41,700	34,600	31,600	30,000
Manganese ore and concentrate, gross weight	10,190	6,146	2,706	3,900	4,200
Silver, mine output, metal content thousand troy ounces	2,209	[r]2,357	2,518	2,684	2,636
Tin:					
Mine output, metal content	386	351	413	304	338
Metal, smelter[e]	100	300	[r]200	[r]200	150
Tungsten, mine output, W content	74	44	11	17	17
Uranium, mine output, U_3O_8 content kilograms	877,930	284,900	221,000	470,462	504,000
Zinc:					
Mine output, metal content	37,509	33,409	35,150	36,381	37,000
Mine, smelter, primary	[r]38,700	[r]38,700	26,800	28,900	32,000
NONMETALS					
Abrasives: Garnet	3	7,200	NA	NA	NA
Asbestos	1,371	1,261	1,280	1,218	1,238
Barite	54,928	49,623	49,279	36,597	40,605
Boron materials, crude	132,655	155,849	125,617	123,492	123,900
Cement, hydraulic thousand tons	6,667	7,133	6,651	5,580	5,645
Clays:					
Ball clay (plastic clay), n.e.s do.	2,198	1,953	1,681	1,362	1,301
Bentonite	157,382	131,384	122,719	123,254	124,800
Foundry earth	41,082	44,871	41,799	91,533	95,500
Fuller's earth (decolorizing clay)	5,445	4,772	5,246	11,795	13,900
Kaolin	132,107	91,417	66,821	72,421	73,000
Laterite (aluminous)	68,580	73,110	86,853	7,060	7,100
Refractory	132,399	176,682	105,741	99,959	101,500
Other[4]	577,226	693,950	407,014	372,807	418,000
Diatomite	7,321	6,527	4,972	6,729	7,397
Feldspar	33,550	32,529	26,118	15,091	18,700
Fluorspar	38,076	15,468	20,755	23,727	24,325
Graphite	10	5	2	12	21
Gypsum, crude	587,432	932,149	670,544	615,540	605,000
Lithium: Spodumene, amblygonite, gross weight	106	80	25	113	120
Mica:					
Sheet	360	218	44	24	28
Waste and scrap	1,140	616	459	298	295
Nitrogen: N content of ammonia	60,576	65,355	40,300	58,000	57,500
Phosphates: Thomas slag[5]	6,676	3,621	673	600	600
Pigments, mineral, natural: Ocher	874	955	739	932	996
Precious and semiprecious stones: Amethyst kilograms	8,000	1,000	1,500	23,043	21,000
Pumice and related volcanic materials	46,324	36,509	51,161	53,540	54,900

See footnotes at end of table.

Table 1.—Argentina: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]		1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued						
Salt:						
Rock	thousand tons	1	1	1	1	1
Solar	do	619	1,003	937	594	550
Total	do	620	1,004	938	595	551
Sand and gravel:						
Sand:						
Construction	do	15,348	17,017	15,273	14,297	14,322
Ferruginous-titaniferous[r]		410	2	3	1	1
Silica sand (glass sand)	thousand tons	329	202	265	227	240
Gravel	do	11,796	10,657	9,522	8,240	8,278
Stone:						
Alabaster		--	--	--	NA	NA
Basalt	thousand tons	3,277	3,721	3,762	4,182	4,193
Calcareous:						
Calcite, nonoptical		12,376	17,888	13,920	6,789	7,950
Calcium carbonate (chalk)		13,174	32,706	4,673	17,154	19,500
Dolomite		289,940	220,521	212,928	257,158	259,900
Limestone	thousand tons	15,238	14,322	14,4[illegible]	12,651	12,880
Marble:						
Aragonite, broken		10,902	7,342	3,689	3,323	3,400
Onyx, in blocks and broken		22,919	23,638	15,911	11,420	11,948
Travertine, in blocks and broken		13,239	16,297	12,144	14,399	14,484
Unspecified, in blocks and broken		108,857	105,415	82,379	51,342	51,818
Flagstone		113,182	[r]162,219	73,243	114,599	114,680
Granite:						
In blocks		38,646	41,005	46,812	33,374	34,800
Crushed	thousand tons	7,310	7,837	6,235	5,439	5,471
Quartz, crushed		96,393	76,692	180,091	76,149	83,100
Quartzite, crushed	thousand tons	1,594	1,675	1,183	1,048	1,098
Rhodochrosite		73	87	30	35	41
Sandstone		89,388	187	160	180	185
Serpentine, crushed		32,376	30,248	28,467	21,284	21,800
Shell, marl		663,472	671,336	800,728	819,009	825,000
Tuff, tufa	thousand tons	2,646	1,974	3,118	1,135	1,139
Strontium minerals: Celestite		122	268	310	776	932
Sulfates, natural:						
Aluminum (alum)		48,454	34,735	4,186	3,850	4,000
Iron (melanterite)		10	100	NA	NA	NA
Magnesium (epsomite)		11,909	8,556	1,000	2,321	2,600
Potassium (kalinite)		300	NA	NA	NA	NA
Sodium (mirabilite)		36,458	37,868	52,018	42,257	45,507
Sulfur:						
Native, from caliche		--	--	10	NA	NA
Byproduct, all sources[e]		20,000	NA	NA	NA	NA
Total		20,000	NA	10	NA	NA
Talc and related materials:						
Pyrophyllite		9,886	5,226	1,026	2,687	3,200
Steatite		882	2,930	1,452	1,490	1,528
Talc		24,059	24,575	33,741	24,716	27,724
Total		34,827	32,731	36,219	28,893	32,452
Vermiculite		5,877	9,907	3,277	3,354	3,400
Water, mineral-containing		97,489	125,746	98,735	88,476	90,398
Zeolite		25	30	40	50	35
MINERAL FUELS AND RELATED MATERIALS						
Asphalt and bitumen, natural		873	992	1,186	2,480	2,912
Coal, bituminous	thousand tons	727	389	498	515	486
Coke, all types including breeze	do	630	546	451	536	453
Gas, natural:						
Gross	million cubic feet	452,570	475,535	471,713	443,009	606,738
Marketed	do	283,560	270,000	327,131	374,416	385,728
Natural gas liquids:						
Natural gasoline	thousand 42-gallon barrels	NA	NA	NA	NA	NA
Butane	do	1,318	1,670	2,211	2,000	2,100
Propane	do	1,586	2,069	3,019	3,000	3,100
Total	do	2,904	3,739	5,230	5,000	5,200
Peat, agricultural		3,516	4,560	2,460	3,800	4,250

See footnotes at end of table.

Table 1.—Argentina: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum:					
Crude ______ thousand 42-gallon barrels__	172,554	179,676	181,352	179,072	179,121
Refinery products:					
Gasoline ______ do____	39,770	44,009	43,658	44,315	44,300
Kerosine ______ do____	4,078	4,587	3,298	3,387	3,300
Jet fuel ______ do____	4,865	6,072	6,102	5,104	5,000
Distillate fuel oil ______ do____	50,688	55,100	56,232	56,095	55,000
Residual fuel oil ______ do____	56,826	51,159	51,132	46,835	47,000
Lubricants ______ do____	2,145	1,939	1,871	2,199	2,200
Other ______ do____	19,202	13,629	12,808	13,966	13,000
Refinery fuel and losses ______ do____	4,800	13,121	14,874	11,284	12,347
Total ______ do____	182,374	189,616	189,975	183,185	182,147

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through July 15, 1984.

[2] In addition to the commodities listed, lime, perlite, and carbon black are produced, but output is not reported quantitatively and available information is inadequate to make reliable estimates of output levels.

[3] Hot-rolled semimanufactures only; excludes castings and cold-rolled semimanufactures produced from imported hot-rolled semimanufactures.

[4] Includes plastic, semiplastic, and/or ferruginous clays used totally in the manufacture of portland cement.

[5] Thomas slag production was estimated from the Thomas crude steel reported in La Siderurgia Argentina 1980-81 annual publication and from a percentage of slag produced from Thomas crude steel reported during 1974-76; for 1979-81, from the reports published by the Instituto Argentino de Siderurgia in 1982.

TRADE

A serious shortage of foreign exchange led to a major international financial rescue operation. Economic policies were geared toward meeting IMF guidelines, but it was difficult to reduce inflation or raise GDP as sharply as planned for 1983. Argentina's favorable balance of trade showed further improvement as the trade surplus widened to $3.5 billion compared with the $2.25 billion surplus in 1982. Exports increased 1.0% over the $7.6 billion in 1982; whereas, imports decreased 21.3% from the $5.3 billion in 1982. During the first 3 months of the year, the earnings from grain exports reached $850 million owing to the sale of 7 to 7.5 million tons of grain, which was principally affected by low prices while imports were reduced largely as a result of severe restrictions. Argentina's main client in 1983 was the Soviet Union, followed by the European Community countries. The European Community countries supplied about one-third of Argentine imports. The main supplier has been the United States. Mineral commodities were a very small part of Argentina's exports, which were dominated by agriculture, meat products, and wool.

According to statistics published by the Ministry of Economy, Secretary of Industry and Mining, the export value of minerals, (metals, nonmetals, and construction materials), not including steel, ferroalloys, and mineral fuels, totaled $35.6 million, a 25% decrease below the $47.4 million exported in 1982. Although mineral exports are insignificant in total trade, they indicated a decreasing trend in the exports of Argentine minerals. Diverse mineral products were exported to 30 countries.

The more important mineral exports from Argentina, and their major markets are shown in table 2.

Table 2.—Argentina: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	Destinations, 1983	
			United States	Other (principal)
METALS				
Beryllium: Ore and concentrate	28	NA		
Iron: Ore and concentrate	NA	62,601	--	All to West Germany.
Lead:				
Ore and concentrate	17,712	21,414	--	France 12,755; West Germany 5,202; Belgium-Luxembourg 3,456.
Metal including alloys, unwrought	50	NA		
Silver: Waste and sweepings value, thousands	$5	$120	--	All to Belgium-Luxembourg.
Tin: Ore and concentrate	1,260	2,634	--	Do.
Tungsten: Ore and concentrate	NA	35	10	West Germany 25.
Zinc:				
Ore and concentrate	10,031	20	--	All to Belgium-Luxembourg.
Metal including alloys, unwrought	4,489	NA		
NONMETALS				
Asbestos, crude	22	NA		
Barite and witherite	NA	61	--	Peru 50; Uruguay 11.
Boron materials:				
Crude natural borates	2,084	20,640	--	Mainly to Brazil.
Oxides and acids	3,614	4,639	1,062	Brazil 2,432; Republic of South Africa 268; Uruguay 220.
Cement	--	42,682	--	Paraguay 31,000; Chile 10,076.
Clays, crude	3,487	5,504	--	Brazil 4,337; Chile 778.
Diatomite and other infusorial earth	5	5	--	Mainly to Uruguay.
Feldspar, fluorspar, related materials	90	149	--	Chile 75; Ecuador 50; Peru 20.
Graphite, natural	NA	5	--	Mainly to Paraguay.
Gypsum and plaster	1,612	4,224	--	Paraguay 3,073; Uruguay 1,151.
Lime	3,839	1,793	--	Mainly to Chile.
Mica: Crude including splittings and waste	11	4	--	Uruguay 3; Chile 1.
Pigments, mineral: Iron oxides and hydroxides, processed	1	13	--	All to Colombia.
Precious and semiprecious stones other than diamond: Natural value, thousands	$56	NA		
Salt and brine	NA	5	--	Mainly to Paraguay.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	61	NA		
Sulfate, manufactured	20	1,361	--	Brazil 761; Uruguay 500; Bolivia 100.
Stone, sand and gravel:				
Dolomite, chiefly refractory-grade	NA	2,427	--	Mainly to Chile.
Sulfur: Elemental: Crude including native and byproduct	NA	10	--	Mainly to Paraguay.
Talc, steatite, soapstone, pyrophyllite	90	3	--	All to Paraguay.
Other: Crude	2,671	NA		

NA Not available.

[1] Table prepared by John G. Panulas. Table reflects data available as of July 1, 1984.

Table 3.—Argentina: Imports of selected mineral commodities[1] in 1982

(Metric tons)

Commodity	Quantity
METALS	
Aluminum: Ore and concentrate	18,105
Chromium: Ore and concentrate	6,198
Iron: Ore and concentrate	1,504
Manganese:	
Ore and concentrate	126,250
Oxides	2,429
Tin: Ore and concentrate	320
Titanium: Ore and concentrate	1,930
Other: Ores and concentrates	204
NONMETALS	
Abrasives	165
Asbestos, crude	15,461
Barite and witherite	677
Cement	1,695
Clays, crude	13,051
Cryolite and chiolite	18
Diatomite and other infusorial earth	913
Graphite, natural	241
Magnesite	8,887

See footnote at end of table.

Table 3.—Argentina: Imports of selected mineral commodities[1] in 1982 —Continued

(Metric tons)

Commodity	Quantity
NONMETALS —Continued	
Mica: Crude including splittings and waste	44
Pyrite, unroasted	197
Stone, sand and gravel:	
Dolomite, chiefly refractory-grade	595
Sand other than metal-bearing	78,975
Sulfur: Elemental, crude including native and byproduct	81,020
Talc, steatite, soapstone, pyrophyllite	337
Other: Crude	142

[1]Table prepared by John G. Panulas. Import data for 1981 and the sources for 1982 were not available at the time this table was prepared.

COMMODITY REVIEW

METALS

Aluminum.—Aluminios Argentinos S.A.I.C. (ALUAR) continued as the largest aluminum producer in the country with an annual production capacity of 144,000 tons of ingots and secondary smelter recovery. However, a slight decline in production of ingots occurred owing mainly to technical problems. This, combined with less imports of partly manufactured products, reduced the overall supply of aluminum by about 7% compared with 1982 output. On the other hand, apparent consumption recorded an important level of recovery of 19%, with demand increasing mainly through the installation of a transmission cable from the Alicura power center to the area of the consumer. ALUAR also planned to buy out one of its main customers, the aluminum concern Kicsa, as part of ALUAR's goal of vertical integration in aluminum production and control of a larger share of the domestic aluminum market. Kicsa currently controls 35% of the domestic aluminum demand with an annual cash flow of $60 million. It was reported that this company was sold by Kaiser Aluminum & Chemical Corp. in 1977.

At yearend, another private company, Uboldi Metals Refinery Co., inaugurated a new aluminum plant to process primary aluminum at Puerto Madryn with an output capacity of 24,000 tons per year.

Instead of importing alumina from other countries, the aluminum industry recommended a plan, as part of a new mining policy, to import bauxite and use conventional methods to manufacture alumina. In addition, the industry was considering a plan to process domestic clays for alumina production, which could save the industry approximately $70 million annually.

Copper.—Argentina's major metalliferous deposits are confined to the Andean Cordillera, which forms part of the Andean geosyncline and is subdivided into four distinct metallogenic provinces. The copper province is seemingly an extension of similar provinces in Chile and Peru, although it appears to be of a younger age. Most of the country's major porphyry deposits lie within it; e.g., El Pachón, Bajo la Alumbrera, and Nevados del Famatina. The huge El Pachón deposit, owned by Cía. Minera Aguilar S.A. (C.M.A.S.A.), does not have good gold values, and it is unlikely to be developed in the current decade. The most likely candidate remains Bajo la Alumbrera in Catamarca Province.

The project is owned by the state mining company Yacimientos Mineros de Agua de Dionisio (YMAD) and contains an estimated 350 million tons of copper reserves. Feasibility studies showed that it could produce 60,000 tons of contained copper, 1 million pounds of molybdenum, 192,900 ounces of gold, and 385,800 ounces of silver. The Government intends to call for an International Bank for Reconstruction and Development loan to help with financing new feasibility studies and tenders for development of the project.

Gold.—Exploration studies at the Erika vein in Andacollo, Neuquén Province, indicated 200,000 tons grading 0.27 ounce of gold per ton. Also in the same region, exploration for alluvial gold deposits continued on a 500-square-kilometer area along the Neuquén River. The Ministry of Economics and the Department of Commerce formed separate commissions to establish regulations for the marketing of gold. The new Argentine Secretariat of Mining announced that gold exploration and development programs were to be started early in 1984 on deposits such as El Retamal in San Juan Province, Santa Catalina in Jujuy, and Comechingones in Córdoba. Also, in the planning stages were an exploration program in Catamarca Province (covering Antofalla, La Hoyada, Los Diablillos, and Calacaste) and the reopening of the Incahuasi Mine in Catamarca, which currently is producing 50 kilograms of gold annually, and the Ophir Mine in La Rioja Province.

Exploration for gold was underway along the Andes Mountains in Jujuy, Salta, La Rioja, Catamarca, San Luis, San Juan, Neuquén, Chubút, and Tierra del Fuego. More than 90% of the current production of gold comes from two deposits: Mina Ángela owned by Cía. Cerro Castillo S.A., a private consortium in Chubút Province, and Farallón Negro in the mining district of Agua de Dionisio in Catamarca Province, owned by the state and the Universidad Nacional de Tucumán.

Iron Ore.—The Port of Bahía Blanca, used to export iron ore pellets from Río Negro, will be remodeled and expanded. A plan to do this has been presented to the Government by a Soviet-led consortium, for a $110 million project, which includes basic and detailed engineering, dredging of the channel, and construction of piers. The consortium consists of Technostroyexport of the U.S.S.R. and five Argentine firms.

There are two medium-size underground iron mines operated by the Dirección General de Fabricaciones Militares (DGFM), and the private sector company Hierro Patagónico S.A. Minera, the largest producer, which operates the Sierra Grande Mine. This underground operation was mining a magnetite deposit in the Río Grande Province. Total production from the three mines was about 1.6 million tons of ore per year.

Argentina imported almost 2.3 million tons of iron ore from Brazil and minor quantities from Chile and Bolivia. Production of iron ore in Argentina in 1983 increased 7% compared with that of 1982.

Iron and Steel.—The Argentine Government awarded Siderúrgica del Sur S.A. a contract to build a sponge iron plant. The plans called for the plant to be built near the Port of San Antonio Este, in Río Negro Province, at a cost of over $6 million. Initial production was planned at 550,000 tons of sponge iron per year.

Sociedad Mixta Siderúrgica Argentina (SOMISA) was to begin using domestically mined coal from the Río Turbio deposits in its steel production. SOMISA was to blend 5% domestic coal with 95% imported coal. The operation requires about 50,000 tons of coal per year. Dalmine Siderca S.A.I.C.'s plans to expand its production capacity were approved by the Argentine Government. The project involves increasing the Midrex direct-reduction module to produce 450,000 tons per year of direct-reduction iron, and the installation of a new 70-ton electric furnace and a 350,000-ton-per-year seamless mill, as well as modernization of existing quality control and finishing installations.

Since 1970, the Argentine steel industry capacity has expanded to over 5 million tons of crude steel. Actual crude steel output peaked in 1979 at 3.2 million tons, then declined in the next 2 years and in 1982 and 1983 rose again to almost 3 million tons. The steel industry consists of four integrated steel plants and two semi-integrated plants. The dominant steel producer, SOMISA, is state owned. In recent years, Argentina has been a net importer of finished steel, but in 1982 and 1983 it began to export modest tonnages.

Table 4.—Argentina: Annual crude steel capacity, by company

Company	Thousand tons
Integrated steel plants:	
ACINDAR-Industria Argentina de Aceros S.A	1,400
Dalmine Siderca S.A.I.C	415
Dirección General de Fabricaciones Militares, Altos Hornos Zapla	310
Sociedad Mixta Siderúrgica Argentina	2,700
Total	4,825
Semi-integrated:	
Aceros Bragados S.A	130
La Cantábrida S.A	130
Total	260

Table 5.—Argentina: Steel production and trade

(Thousand metric tons)

	1979	1980	1981	1982	1983[e]
Production[1]	3,203	2,685	2,526	2,913	2,930
Imports[2]	700	1,084	[e]595	639	--
Exports[2]	541	837	608	891	--

[e] Estimated.
[1] Crude steel.
[2] Steel products.

Lead, Silver, and Zinc.—The St. Joe International Corp., owned by the Fluor Corp., operated in Argentina through its subsidiary, C.M.A.S.A., which owns a lead, zinc, and silver ore body in the Argentine Andes Mountains from which it produced both zinc and lead concentrates. The mill at the mine has a rated daily capacity of 2,300 tons of ore. Nearly all of the zinc and primary lead produced in Argentina is derived from C.M.A.S.A. production. C.M.A.S.A. has operated this property at full production during recent years. The zinc concentrates produced are utilized for the production of slab zinc at an electrolytic zinc refinery operated by Compañía Sulfacid S.A.C.I.y F., in which C.M.A.S.A. owns 50% interest. Other significant producers of zinc, lead, and silver in Argentina are Cía. Geotécnica S.A.C.I., Cía. Río Cincel S.A., and Cía. Cerro Castillo. The first is located in Río Negro Province, the second in Jujuy Province, and the third is in Chubút Province. Because of Argentina's limited market for these commodities in recent years, C.M.A.S.A. has been exporting a portion of the lead and zinc concentrate. Most of the silver from the C.M.A.S.A. ore body is recovered from the lead concentrate.

Manganese.—In the Santiago del Estero Province, reportedly, several medium to large deposits of manganese ore were discovered in 1983, with great future possibilities for exploitation. These deposits have the advantages of good ore quality, excellent geographical location, and a potential national market. The local Dirección General de Minería y Geología through agreements with DGFM and the Subsecretariat of Mining conducted prospecting, exploration, and determination of mineral reserves, mainly in the Departments of Ojo de Agua, Choya, and Guasayán. The manganese region is located in the south of Santiago del Estero Province. This region is composed of 53 known manganese deposits. Most of the Argentine production of manganese has come recently from these regions and deposits such as 25 de Mayo, 9 de Julio, 24 de Septiembre, and the Cautiva in the Province of Córdoba. Within the mining property of YMAD located in the Belén Department, Catamarca Province, manganese ore was exploited in 1983. Production was about 255 to 265 tons of ore per day using cut-and-fill methods of extraction. The ore was treated with cyanide for the recovery of gold and silver, followed by flotation for manganese to produce a concentrate containing about 44% manganese. Owing to maintenance and design problems, the recovery of manganese was low in this flotation process. Consumption of manganese in the steel and ferroalloy plants continued to be high and was estimated at 76,000 tons per year, most of which was to be imported.

Titanium.—The Subsecretariat of Mining of Argentina and the Provincial government of Corrientes signed an agreement for a titanium exploration project in Corrientes Province. The exploration was to be conducted in the Paso de la Patria and Ituzaingó zones and the riverbeds of the Iberá estuaries. The work was to be completed in 1984, and enough information should be available to assess the economic importance of the deposit. The agreement also stipulated that any titanium deposit discovered would be opened to private bidding for exploration and development projects.

Tungsten.—Production of tungsten, which had been declining since 1978, increased in both 1982 and 1983. Most of the production comes from mines in Córdoba, La Rioja, Río Negro, and San Luís Provinces. Two mining companies have been granted a total of $300,000 for exploration projects in Río Negro and Neuquén Provinces. Cía. Geotécnica will explore the San Martín, Alicia, and Pachamán Mines and other areas with tungsten mineralization. Cía. Minera Santa Marta S.A. will explore the Santa Marta Mine area. If exploration is unsuccessful, the Subsecretariat of Mining will assume 80% of the risk. About 50% of the total output of tungsten concentrate in 1983 was exported to the United States, and the remainder was used domestically in the steel industry and elsewhere.

NONMETALS

Boron.—Cía. Boroquímica S.A.M.I.C. A.F., a subsidiary of Rio Tinto Zinc Corp. Ltd., is the major producer of boron minerals in Argentina from the El Porvenir Mine in the Province of Jujuy and the Tincalayu, Cuba, and Manana Mines in the Province of Salta. The Hombre Muerto salt flats are located in the Catamarca-Salta borderline where there are a total of 18 mines. The salt flats cover an area of over 300 square kilometers. The layers of salt have thicknesses of up to 100 centimeters and are predominantly chlorides in the central sector and borates in the playas. The salt crust is almost entirely halite with small quantities of sodium sulfate, gypsum, and borates. The lithium content of the brines is higher than the average for other salt flats in the Puna area.

The Tincalayu Mine, the only one currently exploited, is a fossilized borax body and is in the southern tip of the Tincalayu Peninsula with reserves of 2.5 million tons of 16% to 18% B_2O_3. DGFM was planning to carry out prefeasibility studies for the exploitation of the brines to recover lithium, magnesium, and potassium. Production at the Tincalayu Mine ranges from 100,000 to 150,000 tons of borates per year. Production of borates declined 10%, compared with 1982 output. The primary export customers of borate products were sodium and calcium borates to Brazil and Uruguay and calcium borates (colemanite) to Brazil, along with magnesium borates. Processed borates were shipped to Brazil and other countries. Boric acid went to Brazil, the United States, and other countries.

Cement.—Production of cement increased 1.2%, compared with that of 1982. According to the Argentine Cement Manufacturers Association, the cement industry was having one of the deepest recessions in history owing to the declining construction industry. Domestic demand for cement fell, but exports increased in volume and value. The total installed annual capacity was 11.2 million tons; however, the production level was only 53%.

One of the major cement producers was Cía. Argentina de Cemento Portland S.A., a subsidiary of Lone Star Industries Inc. of the United States. Lone Star operated portland cement plants in Paraná, Entre Ríos Province, and Sierras Bayas, Buenos Aires Province. These two plants' annual production capacities were 191,000 and 1,000,000 tons, respectively. Lower sales in 1983 were expected as a result of a major devaluation of the Argentine peso.

Salt.—The Argentine Secretariat of Mining Resolution No. 113 and Mining Promotion Law No. 22,095 of 1981 granted the official permit to Empresa Minera Tea S.A. to build a potassium salt plant in the locality of Malargue (Mendoza Province) based on processing sodium and potassium chloride, which is abundant in local deposits. A loan of $3.2 million was approved to finance 2,000 meters of exploration drilling to delineate and determine the minable reserves in the Guitarras, Don Roque, El Cruce, and Los Tilos salt deposits. This loan would cover part of the preliminary feasibility study and exploration of such deposits. As with other loans made for mineral exploration, the Government assumed 80% of the risk.

Sulfur.—The annual demand for sulfur in Argentina has increased without interruption since the start of World War II, reaching a high of over 125,000 tons in 1981. This increase led to the development of refining facilities and mines in Argentina during the 1940's. During late 1982 and early 1983, world market conditions and the nature of Argentina's sulfur production were such that imported sulfur again dominated the domestic sulfur market. The latest production of sulfur on record in Argentina was in 1978 when 17,771 tons of concentrates was derived from caliche. Production centers in Mendoza and Salta were shut down because of high production costs. From 1980 to date, the total domestic consumption of sulfur has been imported, and in 1981, the total value of imports was $13 million. The government of Salta Province and DGFM were considering the possibility of reopening the Casualidad property, Department of Los Andes in Salta. The operation would be managed by a Spanish consortium. This property was shut down in 1980 when it was producing 60,000 tons per year.

MINERAL FUELS

Coal.—Argentina planned to invest $300 million in its coal industry and related infrastructure in 1983. Major projects include exploration of the southern basin and completion of a coal port at Punta Loyola, in Santa Cruz Province. The new port would handle domestic and export shipments of Río Turbio coal. Coal is now transported by rail, about 290 kilometers from the mine to the port at Río Gallegos, where it is transferred to vessels and shipped to customers in San Nicolás, Buenos Aires Province.

Port Loyola was scheduled for completion in early 1984 at an initial output of 800,000 tons per year. Argentina produced about 500,000 tons of coal in 1983, down 6% compared with 1982 output. First quarter coal exports were valued at $5 million, and imports, at under $1.0 million, down from $18 million in the first quarter of 1982.

Argentina's Department of Energy announced a program to export coal to European and Far Eastern markets. Argentina currently produces 500,000 tons of steam coal per year. About 300,000 tons would be available for export.

Yacimientos Carboníferos Fiscales (YCF) finalized a contract to export Río Turbio coal to Denmark, according to YCF officials. The sale, for 35,000 tons, was the first success of YCF's marketing program to sell coal to Europe. This was the first large quantity of coal that had been exported from Argentina.

The Secretariat of Energy was soon expected to open international bidding on basic studies for a production expansion of the central-south sector of the Río Turbio coal deposit by the end of October.

Natural Gas.—Natural gas production in Argentina has shown a steady increase since 1978. During 1983, Gas del Estado reported that 385,728 million cubic feet of gas was shipped, an increase of 3% over that of 1982. Currently, gas is not only an important raw material used in the preparation of fertilizers and petrochemicals, but gas is also the energy commodity most suitable for international trade. Export of natural gas to neighboring countries is one method of increasing exports with long-term contracts, thus ensuring a steady source of income. In addition, it is also a geopolitical instrument of Latin American integration.

The proposed pipeline project from the northwest of Argentina to Brazil would allow the reopening of gasfields that were shut down for lack of markets.

With crude oil discoveries and large and growing natural gas reserves, Argentina's hydrocarbons sector will undergo major changes in the next decade. The new administration perceived the need for change and announced its intention to invest and promote investment in developing adequate facilities to treat and transport the large volumes of natural gas that will be available. Argentina and Chile agreed to jointly build a gas pipeline from gasfields in Argentina's Neuquén Province north to Mendoza, and then west over the Andes Mountains to Santiago, Chile. The line would run through Uspallata Pass. To be economic, the gas pipeline would have to carry about 105 million cubic feet of gas per day.

For a number of years, Argentina has been importing both natural gas and other fuels from Bolivia. In January 1983, Argentina agreed to a price increase for the gas imported from Bolivia to $4.28 per million British thermal units (Btu), but reduced the volume to be purchased. The 1983 gas price agreement with Bolivia was part of an overall negotiation on the $556 million debt owed by Bolivia to Argentina.

Argentina also agreed to refinance Bolivia's $245 million debt over 8 years at an interest rate of 8%. There will be a 3-year grace period and a small ($0.15 per million Btu) increase in the price of the Bolivian gas purchases, as partial compensation for a reduction in volume. In 1983, Argentina imported an average of 215 million cubic feet per day of natural gas from Bolivia, a decrease of 3% compared with 1982 imports. Natural gas proven reserves were 692 billion cubic meters at yearend 1982, a 43% increase compared with that of 1981. Existing contracts for the purchase of Bolivian gas through 1992 add approximately 22 billion cubic meters to this figure.

Petroleum.—Argentina's 1983 oil production averaged 490,742 barrels per day, up 3% from that of 1982. However, since private sector output was declining, YPF, the state-owned oil company, was planning increased output to meet an expected rise in oil demand as the country's economy revives. YPF's output rose 4.7% to 334,287 barrels per day, but in the private sector, production declined 9.8% to an average of 144,693 barrels per day. There were 883 wells drilled in 1983, up from 793 in 1982. YPF drilled 566 wells, and the private sector, 317.

Exxon Corp. revived a seismic exploration program in southern Argentina's Río Negro and Chubút Provinces, marking the first action by a foreign operator since the new democratic government assumed power late in 1983. Activity by foreign firms had practically come to a halt because of political and economic upheaval in the country. Exxon's seismic survey covered 4,687 square kilometers at an initial cost of $7 million. Three wells were tentatively slated for drilling before yearend. Most foreign operators were awaiting concrete developments in contract negotiations that have entered their third year with a fourth Argentine Government. YPF plans additional drilling in the Formosa Province near the border with Paraguay. YPF discovered oil in the area with its Largo X-1 wildcat, which reportedly flowed 3,150 barrels per day.

Uranium.—*Nuclear Energy.*—In the early 1970's, Argentina and India were at the head of the Third World nations that had actively entered the field of nuclear development. The nuclear power industry program of Comisión Nacional de Energía Atómica (CNEA) was established in the mid-1960's. The first of its nuclear industrial activities was the prefeasibility study for the Atucha I nuclear powerplant. This study chose natural uranium-heavy water reactors, in order to skirt the developed nations' control of enriched uranium supplies. West German technology was secured through a contract with Siemens AG, and the plant was built with 40% locally made components; 95% of the civil works were done by domestic contractors, and 90% of the assembly was done by Argentine labor. The second project in this program was the Embalse nuclear powerplant (600 megawatts) in Río Tercero, Córdoba Province, which was inaugurated May 3, 1983. This plant also is using the natural uranium-heavy water technology.

Restrictions imposed by Canadian suppliers in the installation of the Atucha I plant forced CNEA to take over the electromechanical and electrical installations. The experience thus acquired proved useful later on, in negotiating with Siemens, through its subsidiary, Kraft Werk Union, for greater participation of Argentine industry in the installation of the Atucha II powerplant. The Embalse nuclear powerplant, built jointly by Canadian, Italian, and Argentine contractors, was finished in 8 years at a cost of approximately $1.3 billion. Following this experience, Argentina decided to become an exporter of nonsensitive (i.e., excluding heavy water and plutonium and uranium enrichment) technology to other countries of Latin America. CNEA pioneered the creation of a number of regional nuclear cooperation projects and signed a number of bilateral cooperation agreements with Brazil, Chile, Colombia, Ecuador, Peru, Uruguay, and Venezuela. The agreement with Brazil was perhaps the most important one, as it represented cooperation between two nations traditionally seen as competitors.

The state-owned Empresa Nuclear Mendoza called for bidding to drill 250 exploration holes at Sierra Pichinan near the Paso de Indio in Chubút Province. The exploration would cover an area of 40,000 square meters. CNEA was carrying out radiometric surveys and trench samplings for uranium deposits in the Gran Laguna Salada region in the Martires Department to evaluate possible uranium resources. The Swiss-built heavy water plant at Arroyito was 75% completed and it was to produce 250 tons per year of heavy water by the end of 1985. The heavy water would be used as a reactor moderator in the Atucha I powerplant, Embalse Río Tercero, and Atucha II (under construction). Production of uranium concentrate in 1983 (yellow cake) increased by 7%, compared with 1982 output.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from the Argentine peso (M$N), new currency, to U.S. dollars at the average exchange rate as of Nov. 28, 1983, of M$N19=US$1.00.

The Mineral Industry of Australia

By Travis Q. Lyday[1]

The economy of the Commonwealth of Australia began to expand toward the end of 1983 after belatedly entering into the world recession at yearend 1981. The growth rate of the real gross domestic product (GDP) declined to -1% during the financial year ending June 30 following the almost stagnant rate of 0.1% growth the previous fiscal year. The estimated GDP for 1983 in current prices was $150 billion.[2] Inflation continued at a historically high level throughout most of the year, but abated slightly at yearend to an annualized 8.6% rate. Unemployment increased throughout the year, reaching more than 10% by yearend, the highest level since the end of World War II. The Australian dollar was devalued March 8, but appreciated steadily thereafter, regaining almost 6 percentage points of the original 10% devaluation against the U.S. dollar by yearend.

Australia is one of the world's leading mineral producers, although the country is relatively unimportant as a mineral consumer. Moreover, Australia currently is one of the few developed countries in the Western World that is a net exporter of mineral fuels. The country's energy resource base includes huge reserves of coal, uranium, and natural gas, considerable quantities of liquid petroleum gas, and major amounts of raw materials such as oil shale, which could provide a base for future synthetic fuel developments. The only significant mineral fuel in which Australia is currently not self-sufficient is petroleum. Nevertheless, Australia still produces about 70% of its requirements domestically.

Although the Australian mineral industry dates back to coal and copper mining shortly after the first European settlements in 1788, the country's mining industry did not come into its own until the gold rushes of the 1850's in New South Wales, Victoria, Western Australia, and Queensland; the lead-silver-zinc discoveries at Broken Hill, New South Wales, in 1883; and the Mount Isa, Queensland, lead-silver-zinc and copper finds 50 years later. Further discoveries followed, and since the 1960's, Australia has become a major world supplier of a score of key mineral products. Australia is the world's leading exporter of alumina, ilmenite, lead, monazite, rutile, tungsten, and zircon, and ranks among the top five exporters of coal, cobalt, iron ore, manganese, nickel, and zinc.

Government Policies and Programs.— One of the highest priorities of the new Australian Labor Party (ALP) government during the year was the establishment of a profit-based resources rent tax (RRT) on the country's minerals and hydrocarbons sectors. By yearend, the Government was focusing its RRT efforts on the petroleum sector since the vast bulk of Australian petroleum production was from offshore areas that come under the responsibility of the Federal Government rather than the individual State. The Government planned to introduce the RRT on the offshore petroleum industry in July 1984 that would encompass all petroleum production including crude oil, condensate, liquid petroleum gas, and natural gas.

The Australian Government published statistics on the extent of foreign ownership and control in the country's mining and mineral processing sectors in September, the first update of these data since 1976.[3] Major foreign participation during 1982, the reference year, was concentrated in metallic mining and processing activities, coal mining, and oil and gas development and processing. The mining and processing of construction materials and other nonmetallic minerals remained primarily an Australian dominated area. Foreign-owned or controlled resource operations provided about 60,000 jobs or over one-third of the total labor force in the Australian minerals resource sector. In June 1982, Australia had a total of 1,490 mining companies, 9% of which was considered as being foreign controlled, and a further 12% as having joint foreign and Australian control.

Concerned by the sharp fall in price of both coking and steaming coals and the danger this posed for marginal coal producers, the Australian Government summoned a national coal "summit" conference in Canberra in March at which representatives of Government, the coal industry, and unions met to discuss ways in which the private sector and the Government could work together to help the industry overcome some of the problems facing it. The conference resulted in the establishment of the Australian Coal Consultative Council comprised of Government, management, and labor, which will provide a continuing forum for discussion on matters relating to the industry.

Official Australian uranium mining policy was set on November 7 when an ALP caucus voted to retain Australia's interest in the nuclear fuel business. The announced policy will permit the development of only one new uranium mining venture, that of Western Mining Corp. Holdings Ltd.'s (WMC) Olympic Dam project at Roxby Downs in South Australia while allowing the two existing producers, Energy Resources of Australia Ltd.'s Ranger Mine, the larger producer, and Queensland Mines Ltd.'s (QML) Nabarlek Mine, both of which are in the Alligator Rivers region of the Northern Territory, to continue their operations. All the other potential prospects—including Jabiluka and Koongarra in the Northern Territory, Lake Way and Yeelirrie in Western Australia, Honeymoon and Beverley in South Australia, and Ben Lomond in Queensland—have been stopped, at least until an inquiry into Australia's role in the nuclear fuel cycle has been completed. This inquiry, to be done by the Australian Science and Technology Council, will look into all aspects of the fuel cycle, including nuclear safeguards and waste disposal.

The Government's decision to limit new uranium mining operations to that of the Olympic Dam was based on its judgment that the Olympic Dam, together with Nabarlek and Ranger, would provide sufficient production capacity to supply Australia's ongoing share of the world uranium market into the late 1990's. Other factors favoring the Olympic Dam project over other projects capable of the same uranium production, 3,000 tons per year, were that Olympic Dam will be primarily a copper project, producing 150,000 tons per year, as well as byproduct uranium and minor amounts of gold and silver, and it has about six times the employment potential of an alternative mine with a similar uranium output.

PRODUCTION

Although the Australian mineral industry generally experienced a difficult time during the 1982-83 biennium as a result of the world recession, mineral production levels, interestingly, did not always reflect the financial troubles faced by the industry. Production of a number of mineral products reached record high levels during 1983, including black coal, copper, lead (mine), natural gas, silver, and zinc. However, earnings per unit of output were generally lower. Production levels of mineral sands, nickel, tin, tungsten, and uranium were lower.

Raw and processed mineral products, including petroleum products and its derivatives, accounted for about 10% of the GDP, 40% of the export value, and about 12% of Federal Government revenues.

Table 1.—Australia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum:					
Bauxite, gross weight thousand tons	27,583	27,179	[r]25,441	23,625	24,000
Alumina do.	7,415	7,246	7,079	6,631	[2]7,231
Metal, refined do.	270	303	379	381	485
Antimony, Sb content of antimony and lead concentrates	1,539	[r]1,379	[r]1,126	1,203	[2]528
Bismuth, mine output, metal content	1,189	[e]900	[e]850	1,540	1,500
Cadmium:					
Mine output, metal content	1,843	[r]1,684	[r]1,753	2,215	[2]2,318
Metal, smelter (refined)	804	1,012	1,031	1,010	[2]1,104
Chromium: Chromite, gross weight	1,855	1,718	--	--	--
Cobalt:					
Mine output, analytic content of:					
Nickel ore	2,202	2,640	[r]2,219	2,511	[2]1,705
Nickel concentrate	762	983	[r]609	967	[2]1,016
Zinc concentrate	82	81	[r]74	70	[2]83
Total	3,046	3,704	[r]2,902	3,548	2,804
Recoverable cobalt	[r]1,583	[r]1,975	[r]1,466	1,810	[3]1,820
Columbium-tantalum concentrate, gross weight	[r]147	[r]202	[r]264	[e]270	[3]90
Copper:					
Mine output, metal content	237,610	243,540	[r]231,339	245,322	256,000
Metal:					
Smelter:					
Primary	[r]163,192	174,920	[r]172,181	175,536	[2]173,620
Secondary	6,194	7,104	5,015	4,809	5,000
Refined:					
Primary	[r]138,371	144,828	164,241	160,195	[2]165,492
Secondary	[r]15,803	[r]20,634	[r]15,297	17,905	[2]27,255
Gold:					
Mine output, metal content troy ounces	596,910	[r]547,687	[r]590,737	866,815	1,035,250
Metal, refined excluding recovery from scrap do.	533,798	474,576	481,971	826,627	[2]953,140
Iron and steel:					
Iron ore:					
Gross weight thousand tons	91,717	95,534	[r]84,661	87,694	75,000
Iron content do.	57,846	[r]60,437	[r]53,361	55,286	48,400
Metal:					
Pig iron do.	7,811	[r]6,959	[r]6,830	5,956	[2]5,045
Ferroalloys:[4]					
Ferromanganese, high-carbon	86,875	94,146	[r]67,563	[r] [e]56,000	79,000
Ferrosilicon	18,990	18,435	[r]18,313	[r] [e]18,000	20,000
Ferrosilicomanganese	19,596	18,376	[r]29,916	[r] [e]27,000	22,000
Total	125,461	130,957	[r]115,792	[r] [e]101,000	121,000
Steel, crude thousand tons	8,125	[r]7,594	7,635	6,371	[2]5,604
Semimanufactures do.	7,043	5,513	5,500	5,100	NA
Lead:					
Mine output, metal content	[5]421,581	[5]397,491	[r]388,122	455,338	[2]477,196
Metal:					
Primary:					
Bullion, for export	[r]169,452	160,286	[r]162,564	181,592	[2]182,594
Refined	[r]215,584	200,454	[r]207,669	218,812	[2]195,696
Total	[r]385,036	360,740	[r]370,233	400,404	[2]378,290
Secondary excluding remelt[e]	42,000	33,200	31,500	28,300	28,000
Manganese ore (metallurgical):					
Gross weight thousand tons	[r]1,698	[r]1,999	[r]1,411	1,123	[2]1,353
Manganese content do.	827	963	695	543	[2]672
Mercury 76-pound flasks	([6])	([6])	--	--	--
Nickel:					
Mine output, metal content	69,709	74,323	74,355	87,552	78,900
Metal, smelter (refined metal and metal content of oxide)	39,341	35,309	42,505	45,931	41,800
Platinum-group metals:[7]					
Palladium, metal content troy ounces	6,880	10,545	12,892	[e]12,000	NA
Platinum, metal content do.	2,765	2,058	2,090	[e]1,900	NA
Ruthenium do.	([6])	([6])	([6])	([6])	--
Total do.	[r]9,645	[r]12,603	[r]14,982	[e]13,900	13,900

See footnotes at end of table.

Table 1.—Australia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
METALS —Continued					
Rare-earth metals, monazite concentrate:					
Gross weight	16,340	14,079	[r]13,282	9,433	14,500
Monazite content	15,139	13,075	[r]12,337	8,769	13,500
Silver:					
Mine output, metal content thousand troy ounces	26,756	[r]24,654	[r]23,906	29,156	[2]32,150
Metal, refined do.	[r]10,300	[r]11,419	[r]12,093	11,189	[2]10,160
Tin:					
Mine output, metal content	12,571	11,588	[r]12,267	12,126	9,700
Metal, refined:					
Primary	5,423	4,819	[r]4,286	3,105	[2]2,913
Secondary[e]	[2]485	490	[r]410	400	400
Titanium concentrates, gross weight:					
Ilmenite thousand tons	[r]1,181	[r]1,385	[r]1,321	1,149	[2]875
Leucoxene	[r]22,470	23,943	[r]19,261	20,138	13,000
Rutile	[r]274,533	[r]311,744	[r]230,817	220,697	172,000
Tungsten, mine output, metal content	[r]3,181	[r]3,561	[r]3,504	2,618	2,060
Uranium, mine output, metal content	706	[r]1,561	[r]2,860	4,422	3,225
Vanadium, mine output, metal content	--	--	[r]92	100	--
Zinc:					
Mine output, metal content	529,157	495,312	518,297	664,800	695,000
Metal, smelter:					
Dust	7,763	(6)	(6)	(6)	--
Primary	[r]305,150	300,959	295,852	291,390	[2]298,518
Secondary[e]	[r]5,000	[r]5,000	4,500	4,500	4,800
Zirconium concentrates, gross weight	444,975	491,547	434,246	462,476	383,500
NONMETALS					
Abrasives, natural:					
Beach pebble	1,568	2,200	[r]2,178	[e]2,300	2,300
Garnet (sales)	1,080	925	763	800	800
Asbestos	79,721	92,418	[r]45,494	19,037	20,000
Barite	94,066	38,633	[r]41,266	40,000	40,000
Cement, hydraulic thousand tons	5,243	5,387	[r]5,946	5,744	[2]4,836
Clays:					
Bentonite and bentonitic clay	6,626	10,988	[r]12,972	[e]11,000	15,000
Brick clay and shale thousand tons	8,050	[r]8,871	[r]7,910	8,839	[2]6,714
Cement clay and shale do.	[r]261	[r]263	[r]433	[e]450	450
Damourite clay (sales)	2,606	3,194	[r]3,011	[e]3,300	3,300
Fire clay[5]	[r]72,179	[r]88,212	[r]142,989	[r] [e]150,000	150,000
Fuller's earth	(6)	(6)	(6)	(6)	--
Kaolin and ball clay	145,326	219,070	[r]170,472	[e]225,000	225,000
Other[5] thousand tons	2,650	1,840	[r]2,069	[e]2,000	2,000
Diamond:					
Gem thousand carats	--	--	21	70	2,170
Industrial do.	--	48	[r]184	487	4,030
Total do.	--	48	205	557	6,200
Diatomite	[r]3,592	3,010	[r]2,073	[e]1,500	2,000
Feldspar including nepheline syenite	3,869	3,648	[r]3,868	2,704	3,000
Gem stones value, thousands	$89,349	[r]$74,787	[e]$110,000	[e]$110,000	$100,000
Gypsum thousand tons	1,230	1,309	[r]1,752	1,800	1,800
Lime[8]	[r]773,821	[r]827,688	[r]874,761	1,225,000	900,000
Magnesite	29,301	32,198	[r]26,445	28,200	28,000
Nitrogen: N content of ammonia	308,300	353,000	[r]319,000	244,900	[2]385,000
Perlite, crude	2,063	2,249	[r]1,476	[e]2,500	2,000
Phosphate rock	7,557	6,621	[r]21,997	[e]235,000	[2]15,300
Pigments, mineral, natural: Ocher	222	53	[r]839	[e]80	200
Pyrites including cuprous, gross weight	44,910	--	--	--	--
Salt thousand tons	[r]5,215	5,665	[r]6,716	6,100	6,900
Sillimanite	568	661	331	783	800
Sodium carbonate[e]	165,000	185,000	190,000	180,000	200,000
Spodumene	--	--	--	[e]80	[2]2,000
Stone, sand and gravel:					
Construction sand[5] thousand tons	24,290	25,694	[r]28,001	[e]27,000	28,000
Gravel[5] do.	16,005	15,667	[r]14,641	[e]17,000	17,000
Dolomite do.	747	843	[r]757	[e]900	900
Limestone:					
For cement do.	7,872	8,132	[r]8,382	[e]8,200	8,500
For other uses do.	3,579	3,598	[r]3,601	[e]3,650	3,800
Silica in the form of quartz, quartzite, glass sand do.	1,068	1,361	[r]1,267	[e]1,420	1,400

See footnotes at end of table.

Table 1.—Australia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Stone, sand and gravel —Continued					
Other:					
Crushed and broken stone thousand tons	56,498	57,737	[r]58,110	[e]59,000	60,000
Dimension stone[9] do.	122	116	[r]125	[e]175	175
Unspecified[10] do.	30,775	35,299	[r]37,295	[e]36,500	38,000
Sulfur:					
S content of pyrites	29,066	--	--	--	--
Byproduct:					
Metallurgy[e]	140,000	140,000	130,000	130,000	130,000
Petroleum	15,501	12,791	[r]14,321	17,496	[2]13,100
Total[e]	184,567	152,791	[r]144,321	[r]147,496	143,100
Talc, soapstone, pyrophyllite	157,475	170,964	[r]82,986	[e]93,000	100,000
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Bituminous and subbituminous thousand tons	[r]93,043	[r]93,632	[r]110,945	118,700	121,050
Lignite do.	[r]32,598	32,895	[r]32,990	37,813	[2]35,000
Total do.	[r]125,641	[r]126,527	[r]143,935	156,513	156,050
Coke:					
Metallurgical do.	5,375	5,023	[r]4,959	3,761	[2]3,018
Gashouse (including breeze)[e] do.	70	80	80	80	80
Total[e] do.	5,445	5,103	[r]5,039	3,841	3,098
Fuel briquets do.	1,157	1,230	1,008	854	[2]689
Gas, natural, marketed million cubic feet	296,006	337,995	400,648	409,439	[2]420,115
Natural gas liquids thousand 42-gallon barrels	[r]28,682	[r]24,153	[r]23,524	18,225	23,000
Peat	14,248	12,211	[e]13,200	[e]13,500	14,000
Petroleum:					
Crude thousand 42-gallon barrels	159,560	139,885	[r]143,672	136,251	[2]152,417
Refinery products:					
Gasoline:					
Aviation do.	428	730	92,922	1,095	[2]93,016
Motor do.	88,183	88,885		94,206	
Jet fuel do.	14,586	14,040	15,136	15,330	[2]14,562
Kerosine do.	1,654	1,891	2,984	3,084	[2]2,496
Distillate fuel oil do.	59,010	53,257	51,899	53,533	[2]51,004
Residual fuel oil do.	28,964	22,258	21,732	21,678	[2]19,560
Lubricants do.	3,717	3,638	34,809	3,556	NA
Other:					
Refinery gas[11] do.	377	371	333	248	NA
Liquefied petroleum gas do.	4,038	3,828	3,816	6,171	[2]3,758
Solvents do.	1,384	1,138	616	876	NA
Bitumen do.	3,283	3,044	2,875	3,115	NA
Unspecified do.	5,522	7,222	7,365	4,219	[2]14,274
Refinery fuel and losses do.	20,633	14,274	15,000	17,696	[2]21,112
Total do.	231,779	[r]214,576	[r]249,487	224,807	219,782

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Includes data available through Aug. 14, 1984.

[2]Reported figure.

[3]Exports.

[4]Data are for years ending Nov. 30 of that stated for plants owned by The Broken Hill Pty. Co. Ltd.

[5]Excludes production from Western Australia.

[6]Revised to zero.

[7]Western Australia only. Metal content of nickel ore.

[8]Data are for years ending June 30 of that stated.

[9]Excludes production from Northern Territory and Australian Capital Territory.

[10]Excludes production from Northern Territory, Australian Capital Territory, and Western Australia.

[11]Residual fuel oil equivalent.

TRADE

The value of mineral exports increased 20% above the 1982 level, reaching a record high $8.7 billion, while mineral imports decreased sharply in value to $1.9 billion, owing largely to a decline in the volume of petroleum imports. Coal, iron ore, and alumina accounted for two-thirds of the value of Australian mineral exports, while uranium, nickel, lead, and zinc added a further 20% to the total.

Japan continued to provide a market for fully one-half of the value of Australian mineral exports. However, Australian foreign trade markets were beginning to become more diversified, with major sales to Western Europe, the United States, Southeast Asia, and the Republic of Korea.

Table 2.—Australia: Exports and reexports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides thousand tons	6,509	5,973	NA	NA.
Metal including alloys:				
Scrap	14,162	28,335	1,064	Japan 23,900; West Germany 794.
Unwrought	79,191	156,612	NA	NA.
Semimanufactures	26,487	37,007	1,562	NA.
Chromium: Ore and concentrate	2	31	--	All to Norway.
Copper:				
Ore and concentrate	116,499	208,108	2,051	Japan 181,160; Republic of Korea 13,526.
Matte and speiss including cement copper	3,526	14,254	--	West Germany 5,358; Japan 5,000; Republic of Korea 2,565.
Metal including alloys:				
Scrap	483	405	(2)	India 241; United Kingdom 58.
Unwrought	[3]18,773	53,126	69	Japan 10,587; Belgium-Luxembourg 10,011; United Kingdom 9,475.
Semimanufactures	[3]2,443	37,568	2,383	New Zealand 13,496; Saudi Arabia 8,967.
Gold: Metal including alloys:				
Content of ores and concentrates troy ounces	111,692	64,300	NA	NA.
Unwrought and partly wrought do	125,774	318,935	NA	NA.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite thousand tons	71,202	78,183	--	Japan 55,961; Republic of Korea 4,689; China 1,830.
Metal:				
Scrap do	642	1,133	--	NA.
Pig iron, cast iron, related materials	158,460	91,410	17,700	Japan 34,379; Indonesia 11,255.
Ferroalloys:				
Ferromanganese	16,424	16,682	5,500	Indonesia 4,728; Qatar 4,352.
Unspecified	23,298	25,716	12,200	Japan 6,746; Singapore 3,435; Indonesia 1,544.
Steel, primary forms	698,627	710,192	6,755	Republic of Korea 165,263; Philippines 99,299; Argentina 88,190.
Semimanufactures:				
Bars, rods, angles, shapes, sections	150,150	202,729	221	New Zealand 49,517; Belgium-Luxembourg 31,487; Singapore 19,822.
Universals, plates, sheets	195,939	505,010	114,704	New Zealand 80,711; China 62,011; Pakistan 52,818.
Hoop and strip	22,482	302,903	718	New Zealand 294,989; Indonesia 3,633.
Rails and accessories	1,432	19,876	--	Saudi Arabia 19,596.
Wire	[3]5,414	9,837	606	New Zealand 3,100; Hong Kong 1,326; Papua New Guinea 1,316.
Tubes, pipes, fittings	[3]42,140	31,868	12	Papua New Guinea 2,654; unspecified 26,658.
Castings and forgings, rough	6,677	5,313	1,467	Singapore 1,380; Papua New Guinea 1,013.

See footnotes at end of table.

Table 2.—Australia: Exports and reexports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Lead:				
Ore and concentrate	61,540	94,607	39,765	United Kingdom 29,695; Japan 11,065; Romania 10,115.
Oxides	3,800	2,644	--	Indonesia 572; Thailand 319; Singapore 290.
Metal including alloys:				
Scrap	5,332	2,056	--	Philippines 551; Japan 229; India 192.
Unwrought	(4)	358,679	7,256	United Kingdom 165,655; India 54,065.
Semimanufactures	11,029	218	--	Singapore 86; Thailand 73.
Manganese: Ore and concentrate thousand tons	r903	921	60	Japan 475; Republic of Korea 81; Pakistan 25.
Nickel:				
Ore and concentrate value, thousands	--	$395	--	All to United Kingdom.
Matte and speiss do	$299,998	$264,202	NA	NA.
Metal including alloys:				
Scrap	175	740	--	Japan 236; United Kingdom 43.
Unwrought and semimanufactures value, thousands	$148,663	$136,150	NA	NA.
Platinum-group metals: Metals including alloys, unwrought and partly wrought do	$1,092	$2,004	$13	Hong Kong $486; Netherlands $457; Belgium-Luxembourg $285.
Silver:				
Ore and concentrate[5] do	$1,210	$85	$39	United Kingdom $33; New Zealand $13.
Waste and sweepings[5] do	$855	$382	--	United Kingdom $257; West Germany $85.
Metal including alloys, unwrought and partly wrought do	$56,483	$67,901	$1	United Kingdom $45,606; Japan $17,898.
Tin:				
Ore and concentrate	14,849	33,279	52	Malaysia 31,329; United Kingdom 545.
Metal including alloys:				
Scrap	798	656	--	United Kingdom 360; Japan 195; India 99.
Unwrought	1,410	682	338	New Zealand 130; United Kingdom 103.
Semimanufactures	693	325	(2)	Papua New Guinea 132; Malaysia 43; New Zealand 40.
Titanium: Concentrates thousand tons	r1,139	1,025	353	United Kingdom 221; Japan 93; U.S.S.R. 80.
Tungsten:				
Ore and concentrate	6,347	81,801	28	West Germany 79,831; U.S.S.R. 546.
Metal including alloys, all forms	NA	9	--	Papua New Guinea 6; New Zealand 1.
Uranium and thorium: Ore and concentrate value, thousands	$144,245	$510,127	$165,335	France $119,524; West Germany $72,039.
Zinc:				
Ore and concentrate thousand tons	459	1,020	--	Japan 765; Republic of Korea 67; United Kingdom 55.
Oxides	120	274	--	India 160; New Zealand 53; Fiji 31.
Metal including alloys:				
Scrap	1,111	1,480	--	India 430; Republic of Korea 258; Japan 106.
Unwrought	194,678	236,258	30,024	Indonesia 59,354; China 33,597; India 17,168.
Semimanufactures	5,923	18,137	--	United Kingdom 12,838; Belgium-Luxembourg 2,552.
Zirconium: Ore and concentrate	444,186	405,203	NA	NA.
Other: Base metals including alloys, all forms	NA	3,435	983	India 2,076.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	NA	2,261	1,695	Saudi Arabia 406; United Kingdom 117.
Artificial: Corundum	58	5	--	All to New Zealand.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$191	$24	--	Japan $10; New Zealand $4.

See footnotes at end of table.

Table 2.—Australia: Exports and reexports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Abrasives, n.e.s. —Continued				
Grinding and polishing wheels and stones	NA	169	--	Pakistan 87; New Zealand 30.
Asbestos, crude	39,261	15,697	11	Thailand 4,791; Indonesia 2,977; Singapore 2,386.
Barite and witherite	NA	636	(2)	New Zealand 383; Republic of South Africa 198.
Cement	197,214	294,683	119,500	Bahrain 130,070; Papua New Guinea 15,947.
Clays, crude	3,170	5,011	--	Japan 1,492; Philippines 1,247; United Kingdom 981.
Diamond:				
Gem, not set or strung value, thousands	$23,714	$5,389	$206	Hong Kong $1,028; Singapore $762; New Zealand $568.
Industrial do	$4,917	$2,910	$190	United Kingdom $1,437; Canada $238; Switzerland $236.
Diatomite and other infusorial earth	NA	58	--	Malaysia 23; New Zealand 14; Philippines 10.
Fertilizer materials:				
Crude, n.e.s	1,580	3,097	2	Philippines 1,409; Singapore 319.
Manufactured:				
Ammonia	NA	980	--	New Zealand 942; Papua New Guinea 28.
Nitrogenous	20,921	10,745	--	New Zealand 8,739; Papua New Guinea 651.
Phosphatic	778	2,090	--	Philippines 904; Sri Lanka 396; New Zealand 328.
Potassic	25	4	--	Hong Kong 2; Malaysia 1.
Unspecified and mixed	1,370	1,053	--	Japan 683; Papua New Guinea 210.
Graphite, natural	40	8	--	New Zealand 7.
Gypsum and plaster	620,807	607,017	--	Indonesia 173,696; New Zealand 124,507; Singapore 89,566.
Lime	2,529	931	--	Indonesia 828; Papua New Guinea 84.
Magnesite	2,738	2,816	180	New Zealand 2,415.
Mica: Worked including agglomerated splittings	NA	216	--	Papua New Guinea 90; Philippines 48; Malaysia 35.
Nitrates, crude	--	1	--	All to Papua New Guinea.
Phosphates, crude	3	26,905	--	Republic of Korea 15,937; Japan 10,890.
Pigments, mineral: Iron oxides and hydroxides, processed	351	191	54	New Zealand 89; Papua New Guinea 30.
Precious and semiprecious stones other than diamond: Natural and synthetic value, thousands	$53,732	$33,975	$2,494	Thailand $11,003; Hong Kong $6,059; Japan $5,646.
Salt and brine thousand tons	NA	4,144	--	Japan 2,978; Republic of Korea 574.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	241	84	--	Singapore 37; New Zealand 31.
Worked	NA	28	1	New Zealand 13; Singapore 7.
Dolomite, chiefly refractory-grade	--	16	--	All to Hong Kong.
Gravel and crushed rock	384,271	530,157	20,183	Japan 370,179; Republic of Korea 78,506; Singapore 34,100.
Limestone other than dimension	--	15	--	All to Papua New Guinea.
Sulfur:				
Elemental: Crude including native and byproduct	NA	583	--	New Zealand 229; Thailand 108; Philippines 92.
Sulfuric acid	255	189	--	Papua New Guinea 93; New Caledonia 31.
Talc, steatite, soapstone, pyrophyllite	82,642	93,878	3,350	Japan 51,096; New Zealand 15,785; Belgium-Luxembourg 12,597.
Other:				
Crude	NA	1,630	(2)	Japan 848; New Zealand 434; Singapore 127.
Slag and dross, not metal-bearing	NA	34	--	Malaysia 18; Papua New Guinea 16.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	44,612	35,468	--	Indonesia 14,693; New Zealand 8,233; India 5,053.

See footnotes at end of table.

Table 2.—Australia: Exports and reexports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coal:				
Anthracite and bituminous thousand tons	50,569	46,658	20	Japan 30,507; Republic of Korea 3,661; United Kingdom 2,185.
Lignite including briquets do	40	56	--	Republic of Korea 29; Japan 27.
Coke and semicoke do	NA	56	--	Japan 22; Norway 15; Yugoslavia 15.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	15,626	15,864	708	Japan 14,140; Kuwait 476.
Gasoline do	3,298	2,814	--	New Zealand 1,837; Singapore 309.
Mineral jelly and wax do	9	14	--	Malaysia 5; New Zealand 5.
Kerosine and jet fuel do	2,511	4,719	--	New Zealand 1,163; Fiji 475; bunkers 2,780.
Distillate fuel oil do	5,785	5,566	(2)	Indonesia 1,497; Fiji 847; bunkers 947.
Lubricants do	1,137	1,576	84	Singapore 307; New Zealand 217; United Arab Emirates 129.
Residual fuel oil do	2,569	7,145	996	Singapore 1,053; Japan 752; bunkers 2,948.
Bitumen and other residues do	NA	230	(2)	New Zealand 113; Canada 36; United Arab Emirates 32.
Bituminous mixtures do	NA	4	(2)	Tonga 2.

[r] Revised. NA Not available.
[1] Table prepared by W. L. Zajac. Import data for 1982 were not available at the time of publication.
[2] Less than 1/2 unit.
[3] Totals are incomplete owing to a lack of reported detailed data.
[4] Unreported quantity valued at $308,744,000; 1982 total valued at $285,486,000.
[5] May include platinum-group metals.

COMMODITY REVIEW

METALS

Alumina, Aluminum, and Bauxite.—Australia remained the unchallenged world leader in alumina and bauxite production. Although other areas were being examined, bauxite mining was limited during the year to the huge Weipa deposit located on the Cape York Peninsula, Queensland; the Gove operation across the Gulf of Carpentaria in Arnhem Land, Northern Territory; and the bauxite reserves southeast of Perth in the Darling Range, Western Australia.

Alumina production increased 9% largely because Alcoa of Australia Ltd. returned its Western Australian refineries to full operating rates by midyear and because the Gladstone refinery of Queensland Alumina Ltd., the world's largest single-stream plant, recommissioned idle capacity during the second half of 1983.

The 27% increase in aluminum production was attributed mainly to a return to full capacity by Alcan Australia Ltd. at its Kurri Kurri, New South Wales, smelter but also to increased production by Comalco Ltd. at its new Boyne Island, Queensland, smelter as it was progressively commissioned. Operation at the full capacity of 206,000 tons was expected by the middle of 1984. In 1983, Alcan Australia announced plans to resume construction of the third potline, rated at 45,000 tons per year and originally begun and stopped in 1982 owing to declining demand, at its Kurri Kurri smelter.

Production of bauxite was estimated to have increased 1.6% despite production cutbacks early in the year by Comalco at its Weipa Mine as a result of maritime disputes.

The Worsley bauxite mining and refining complex, a joint venture of Reynolds Alumina Australia Ltd. (40%), Shell Co. of Australia Ltd. (30%), BHP Minerals Ltd. (20%), and Kobe Alumina Associates (Australia) Pty. Ltd. (10%), was nearing completion at yearend. The $1.1 billion project was expected to start up early in 1984. The initial annual capacity of the alumina plant will be 1 million tons; however, the design provides for later expansion to 2 million tons.

Alcoa announced that its Wagerup alumina refinery, completed in June 1982 but mothballed immediately owing to the world recession, would begin operations in early

1984. Output from Wagerup will raise Alcoa's Australian alumina production to 4.5 million tons per year.

The first of two 115,000-ton-per-year potlines at the Tomago Aluminium Co. Pty. Ltd.'s aluminum smelter in the Hunter Valley, New South Wales, was commissioned in September 1983. The second potline was expected to come on-stream beginning in early 1984, reaching full capacity some 6 months later. With the completion of this smelter, Australia will have more than doubled its primary aluminum capacity since 1980.

Copper.—Estimated mine production of copper reached an all-time high of 256,000 tons of contained copper, 2% greater than the previous maximum set in 1974. Total mine production increased because of higher output owing to an increase in copper prices averaging 21% at the following mines: Mount Isa, Queensland; Tennant Creek, Northern Territory; Cobar and Woodlawn, New South Wales; Mount Lyell, Tasmania; and Teutonic Bore, Western Australia.

EZ Industries Ltd. (EZI) announced plans for a feasibility study of the Scuddles copper-zinc deposit at the Golden Grove Prospect near Yalgoo, Western Australia, in October. Partners in the joint venture were comprised of EZI, Amax Australia Ltd., Esso Exploration and Production Australia Inc., each with 31.16% interest, and Aztec Exploration Ltd., 6.25%. EZI was named the operator for the underground evaluation program consisting of sinking a shaft and collecting bulk ore samples for pilot plant and other metallurgical testing. The program was to be completed in 1986. EZI reported that the Scuddles ore zones contain 21.2 million tons of ore averaging 1.2% copper, 8.2% zinc, and 67 grams of silver per ton.

M.I.M. Holdings Ltd.'s Mount Isa underground mine in northwestern Queensland has long been the dominant producer of copper in Australia, accounting for nearly 70% of production in recent years. M.I.M. facilities include a smelter at Mount Isa and a refinery at Townsville on Queensland's coast.

Gold.—Following a 47% increase in mine production of gold in 1982 over that of 1981, output again increased in 1983. Although production, estimated at slightly more than 1 million troy ounces, was the highest in 22 years, it was well below the Australian record high set in 1903 when more than 3.8 million troy ounces was produced. The largest share of production continued to be from Western Australia, with about 75% of production. The remaining gold came from the eastern States of New South Wales, Queensland, and Victoria, and the Northern Territory, mostly as a byproduct from sulfide ore. Alluvial gold accounted for only minor amounts of production, although the percentage increased slightly with the commencement of operations at the medium-size alluvial mine at Nullagine, Western Australia, by Metana Minerals NL in April.

Exploration activity, already flourishing in recent years throughout Australia, had a remarkable upsurge during the year. Mining companies have turned to gold exploration owing to the historically low prices for many metals, the extremely high cost of hydrocarbons exploration, particularly in offshore areas, as well as comparatively high prices of gold. Most mining companies operating in Australia have become involved directly or indirectly in gold exploration. In addition, the development of new technology in recent years, such as improved opencut mining methods, carbon-in-pulp extraction, and heap-leaching techniques for low-grade ores, has led to a change in exploration targets; mining companies were no longer searching exclusively for high-grade ore. Most exploration was being directed toward additional reserves at established mines and for near-surface, albeit low-grade, ores that can be mined by opencut methods.

A noticeable trend in gold production during the year was the treatment of mine tailings. Peko-Wallsend Ltd., with a 40% interest from Australian Anglo-American Gold Pty. Ltd., recovered gold from the Mount Morgan, Queensland, tailings dumps. The Golconda venture at Blue Spec, Western Australia, also reported production from treatment of tailings dumps, and several other tailings treatment operations were being evaluated at yearend, including Alkane Exploration NL's West Wyalong, New South Wales, leases.

A feasibility study on mining Pancontinental Mining Ltd.'s Paddington gold deposit near Kalgoorlie in Western Australia continued by Davy McKee Pacific Pty. Ltd.

Production at the Horseshoe Lights opencut gold mine, 160 kilometers north of Meekatharr, Western Australia, reached full capacity at the beginning of the year.

Iron and Steel.—Iron ore production decreased substantially, reflecting both planned cutbacks by producers in accordance with recession-induced domestic and export demand and the effects of industrial disputes.

Australian iron ore production remained heavily concentrated in the Pilbara region of Western Australia, which accounted for almost 95% of the country's total. Major Pilbara producers included the Robe River Mine of Cliffs Robe River Iron Associates, Goldsworthy Mining Ltd.'s Shay Gap and Sunrise Hill Mines, Hamersley Iron Pty. Ltd.'s Mount Tom Price and Paraburdoo Mines, and Mount Newman Iron Ore Pty. Ltd.'s Mount Whaleback Mine, the world's largest single iron ore mine. Hamersley Iron and Mount Newman Iron Ore remained, respectively, the second and third largest iron ore mining companies in the world after Brazil's state-mining company Cia. Vale do Rio Doce. With additional ore produced from the Middleback Ranges in South Australia and from Yampi Sound, Western Australia, by BHP Minerals, and the relatively small iron ore project at Savage River, Tasmania, Australian iron ore production was almost 78 million tons in 1983, including 3 million tons of pellets.

Iron ore exports increased 2% over those of 1982. The continued decrease in shipments to Japan was offset by a further increase in shipments to other major markets, with substantial increases in exports to China and Taiwan. The value of iron ore exports on a free-on-board basis increased by 10% to a record high $1.77 billion owing to the slight increase in shipments, depreciation of the Australian dollar relative to the U.S. dollar, in which the contract prices were expressed, and increases in the contract prices negotiated in 1982 but which remained in effect throughout the year.

Dampier Mining Co. Ltd.'s Koolyanobbing Mine in the south of Western Australia was closed in August. The closure was delayed since April 1982 when the Kwinana blast furnace, which the mine mainly supplied, was shut down.

Production of pig iron decreased by 15%, reflecting continued reduced steelmaking requirements as well as the closure of the Kwinana furnace. Crude steel production by BHP Minerals at its Whyalla, South Australia, plant increased 2% to a little more than 900,000 tons, partly to meet increased export orders, but BHP Minerals' plants at Newcastle and Port Kembla in New South Wales registered declines of 16% to 1.55 million tons and 12% to 3.18 million tons, respectively.

A second producer entered the Australian steel sector during the year when Smorgan Consolidated Industries Pty. Ltd. commissioned its plant at Laverton North, Victoria. The plant produced steel from locally generated scrap and consisted of an electric arc furnace, a continuous billet caster, and a rolling mill. Reportedly, plans were being formulated by other interests to establish a similar plant at Brisbane, Queensland, by 1985 at a cost of about $100 million.

Tariff quotas on certain flat steel and iron and steel pipe and tube products, which were introduced in August 1982 to contain imports of those products at 1981-82 levels, were extended to the end of 1983. In addition, bounty payments were introduced on domestic sales of certain high-alloy steel products produced domestically to counteract the effects of imports.

Lead and Zinc.—With the exception of the copper-silver-zinc Teutonic Bore Mine in Western Australia, a joint venture of Seltrust Holdings Ltd. (60%) and M.I.M. (40%), all of Australia's lead and zinc was produced at the same mines, since the two metals occur in associated minerals in the same ore bodies. The principal producing lead-zinc mines were the three mines operated by New Broken Hill Consolidated Ltd. (NBHC), North Broken Hill Holdings Ltd., and Zinc Corp. Ltd., all at the Broken Hill, New South Wales, mining center, which celebrated its centennial this year; M.I.M.'s Mount Isa Mine in northwestern Queensland; Cobar Mines Pty. Ltd.'s mine in eastern New South Wales; the Woodlawn Mine, also in eastern New South Wales, owned and operated by the equal joint venture partners St. Joseph International Explorations, Phelps Dodge Exploration Corp., and NBHC; EZI's three mines at Rosebery on the Tasmanian west coast; and EZI's new Elura, New South Wales, underground mine, which was gradually phasing in production since early in the year.

Following significant increases in 1982, mine production of lead and zinc increased again to new record-high levels owing to large increases in production at Mount Isa, the phasing in of production at Elura, and minor increases in production at the mines in Tasmania, Broken Hill, and Cobar. In addition, a minor increase in zinc production was recorded at the Teutonic Bore Mine.

Production of lead bullion increased only slightly following a substantial increase in 1982. The production level at Mount Isa's smelter remained about the same as in 1982, as did that of Sulphide Corp. Pty. Ltd. at its Cockle Creek, New South Wales, smelter. Production at The Broken Hill Associated Smelters Pty. Ltd.'s Port Pirie, South Australia, refinery, Australia's only producer of primary refined lead, decreased owing to a breakdown at the plant in the latter part of the year. Estimated production of secondary refined lead remained level with that of 1982.

Primary refined zinc production increased slightly. Decreased production at EZI's Risdon, Tasmania, plant was offset by increases at Cockle Creek and Port Pirie.

Exports of lead concentrates remained at about the same level as those of 1982 although the lead content increased substantially. Zinc concentrate exports were estimated to have increased significantly. About 90% of Australia's lead mine production was processed to bullion or refined lead domestically, thus making Australia a relatively small exporter of lead concentrates, but by far the largest exporter of bullion and refined metal compared with other producer countries. Unlike lead, however, less than one-half of the zinc concentrates produced was processed to refined metal.

M.I.M. opened its new $11 million bulk handling terminal for zinc concentrate at Townsville, Queensland, in May. The terminal has a 70,000-ton storage capacity, which can be expanded to 125,000 tons. The facility was constructed to handle increased quantities of zinc concentrate for export as more requirements of the Risdon refinery will be supplied from the Elura Mine.

Manganese.—Virtually all production of manganese ore continued to be by Groote Eylandt Mining Co. Pty. Ltd., a wholly owned subsidiary of BHP Minerals, on Groote Eylandt, Northern Territory. Production increased 20% over that of 1982 owing primarily to demand from recently established markets in Europe, Mexico, and the U.S.S.R.

Exports of manganese ore increased 11%. Exports to the Federal Republic of Germany, Mexico, Switzerland, and the U.S.S.R. began with the latter becoming the third largest market after Japan and the Republic of Korea. These new markets, combined with increased shipments to the Republic of Korea, Taiwan, and Yugoslavia, more than balanced decreased shipments or a termination of exports to other markets.

Shipments of manganese ore for domestic consumption, mainly in manganese alloy and pig iron production, decreased significantly from 1982 levels.

Ferromanganese production at Bell Bay, Tasmania, by Tasmanian Electro Metallurgical Co. Pty. Ltd., also a wholly owned subsidiary of BHP Minerals, increased by 41%, but silicomanganese production fell by 19%. The plant continued to operate with one furnace shut down owing to depressed domestic demand for manganese alloys.

Mineral Sands.—The reduced demand in world markets for mineral sands products, including ilmenite, monazite, rutile, and zircon, continued, resulting in a substantial decrease in production of the concentrates of these minerals in Australia, except for monazite, which increased almost 54% from the 1982 level. Australia continued to dominate world markets for monazite (80%), rutile (60%), and zircon (70%) and accounted for a major share of ilmenite (25%) production as well, despite the competitive nature of the mineral sands industry and Australia's distance from major world markets.

The beginning of a sustained upturn in the economies of Australia's major mineral sands markets, Europe and the United States, from about midyear led to an increased demand for rutile, particularly in the pigment sector. As a result, a large portion of surplus rutile stocks held by Australian producers was reduced by yearend. Ilmenite stocks were beginning to fall at yearend. In contrast, demand for zircon as a foundry sand and as a source of high-quality refractories continued to ease, with a consequent increase in producer stocks.

Virtually all production of monazite, rutile, and zircon concentrates was exported, along with about 90% of the ilmenite concentrate. The remainder of the ilmenite was consumed within Australia for the production of titanium dioxide pigments for the domestic paint industry and for the production of synthetic rutile at Associated Minerals Consolidated Ltd.'s (AMC) two plants at Capel, Western Australia.

The Australian mineral sands industry was, generally, divided into three groups, the producers of rutile and zircon on the east coasts of Queensland and New South Wales, the producers of ilmenite and zircon on the far southwest coast of Western Australia centered at Capel, and the producers of ilmenite, monazite, rutile, and zircon at Eneabba, 270 kilometers north of Capel in Western Australia. Principal mineral sands producers were AMC at North Stradbroke Island, Queensland, and at Capel and Eneabba; Consolidated Rutile Ltd. at North Stradbroke Island; Rutile & Zircon Mines Ltd. (R&Z Mines) at Newcastle, New South Wales; and Westralian Sands Ltd. at Capel.

Mineral Deposits Ltd. ceased mining in the Myall Lakes area of New South Wales during the year, leaving R&Z Mines as the only significant mineral sands producer in the State.

Nickel.—The nickel industry in Australia began in 1967 and has expanded to become one of the world's largest. Economic nickel concentrations occur as sulfide ore associated with mafic and ultramafic intrusive rocks in Western Australia and as lateritic ore formed by weathering and erosion of ultramafic rocks containing nickel in both Western Australia and northern Queensland. The sulfide deposits are mined by underground methods, while the lateritic ores are recovered from open pits.

Australia's major nickel producer in 1983 was WMC, operating 13 mines at Kambalda, Western Australia. WMC also operated a smelter at Kalgoorlie and a refinery at Kwinana, both in Western Australia.

Metals Exploration Ltd.'s underground Nepean Mine, Western Australia, was placed on care and maintenance in February owing to poor nickel prices. The nickel concentrates were custom smelted at WMC's Kalgoorlie works.

Metals Exploration (51%) and Amoco Minerals Australia Co. (49%) hold the sulfide resources at the Forrestania nickel project in Western Australia. Exploration indicated that the nickel occurs at five locations, containing a total of 11.7 million tons of ore grading 2.29% nickel. Exploration and planning for mine development continued during the year.

Mining and refining of the lateritic ore in Queensland occurs at Greenvale, 225 kilometers west of Townsville, and Yabulu at Townsville, respectively. Queensland Nickel Pty. Ltd., a joint venture of Metals Exploration and Freeport-McMoran Inc. of the United States, and Australia's second largest producer of nickel, operated both facilities. Cobalt was recovered as a byproduct from Greenvale's lateritic ore.

NONMETALS

Diamond.—Culminating more than a decade of exploration and development, the Argyle Diamond Mines Pty. Ltd., a joint venture of CRA Ltd. (56.8%), Ashton Mining N.L. (38.2%), and the Western Australian government-owned Northern Mining Corp. NL (5%), began commercial production of diamonds from its Upper Smoke Creek alluvial deposit in the eastern Kimberley region in the north of Western Australia in January. In April, initial production of 2,000 tons per day of ore was expanded to 4,000 tons per day. Production for the year was 6.2 million carats recovered, comfortably in excess of the 5 million carats anticipated, from 1.07 million tons of ore.

Work progressed on schedule for the much larger production from the joint venture's primary diamond resource, the nearby AK-1 kimberlite pipe. Scheduled for startup in late 1985 or early 1986, the AK-1 open pit was being designed for a mining rate of 3 million tons per year of ore, producing 25 million carats per year.

Diamond production from the Argyle project at full production will represent a 40% addition to the world supply of natural diamonds. About 55% of Argyle production will be industrial diamonds, however, and this will represent only a 10% addition to total industrial diamond supply. About 5% of the Argyle production will be gem quality.

In late 1982, CRA and Ashton signed a contract with De Beers Central Selling Organization (CSO), Republic of South Africa, for marketing the bulk of Argyle production, selling all of their rough gem production through the CSO, selling 75% of the remaining cheap gem and industrial diamonds through the CSO, and selling 25% of the cheap gem and industrial diamonds on the open market. Northern Mining exercised its right to retain 5% of the Argyle production for independent sale through the Antwerp, Belgium, diamond dealer Arslanian Freres PVBA.

The discovery of diamonds and kimberlite indicator minerals was reported from other areas of Australia during 1983, including areas of northwest Northern Territory, the Terowie and Eurelia areas of South Australia, and the Kimberley region and Kalgoorlie area of Western Australia. Investigation of the diamond-bearing deposits of the Copeton area, New South Wales, also continued.

Gem Stones.—Aside from diamond, Australia's gem stone industry consisted almost entirely of the production of opal and sapphire. Small quantities of minor gem stones, such as amethyst, garnet, and nephrite jade, were undoubtedly produced, however.

Australia continued to be the world's major producer of opal, reportedly accounting for 80% to 95% of opal in the world market. Opal was mined at the Lightning Ridge District, central-northern New South Wales; the Andamooka, Coober Pedy, and Mintabie Fields, South Australia; and from a number of small localities in Queensland.

Australia produced an estimated 70% to 80% of the world's uncut sapphires. Production was from the Anakie Field, central Queensland, and from the Inverell and Glen Innes areas, New South Wales.

Phosphate Rock.—Production of phosphate rock was estimated at 15,300 tons. Imports of phosphate rock increased by 12% from the 1982 level to an estimated 2.16 million tons. However, consumption of rock for production of manufactured fertilizer, as reported by the Australian Phosphate Corp., and production of superphosphate decreased markedly, by 16% and 19%, respectively.

As a result of failing to renegotiate supply contracts for the year with Australian fertilizer manufacturers, Queensland Phosphate Ltd. (QPL) ceased mining operations at Phosphate Hill, 65 kilometers south of Duchess, Queensland, at yearend 1982. Plant production continued through January 1983 from stockpiled ore, and rail dispatches continued until mid-March, however. QPL, previously a wholly owned subsidiary of BH South Ltd., became 83.5% owned by WMC following BH South's liquidation early in the year.

An estimated 4,000 tons of phosphate rock was produced in South Australia, but it was unsuitable for superphosphate manufacture owing to its high iron and aluminum content, and it was used directly as fertilizer by Adelaide and Wallaroo Fertilizers Ltd.

MINERAL FUELS

Coal.—Both production and exports of black coal attained record-high levels, despite the industry having faced another difficult year owing to continued stagnant international demand, worldwide oversupply, large domestic stockpiles, and substantial price reductions on many export contracts. As a result of these adverse conditions, exploration activity suffered a significant reduction.

Coal remained Australia's largest single export earner, accounting for over one-third of export revenues from the minerals sector, and about 15% of the country's export earnings. In addition, coal accounted for more than 30% of the mining industry's employment. Slightly more than 60% of Australia's salable coal production of 100 million tons was exported and somewhat less than 40% was consumed domestically. Coking coal continued to be primarily produced for export, although an estimated 8 million tons was consumed in domestic steel production, while steaming coal retained its traditional role for use primarily in domestic power generation.

In January, it was announced that BHP Minerals was to acquire Utah International Inc., a subsidiary of the U.S.-based General Electric Co. (GE) and the parent company of Utah Development Co., the operator of the five largest coal mines in Australia. By yearend, BHP Minerals was well along in arranging a consortium to purchase Utah International's coal interests as well as some of BHP Minerals' coal operations in Queensland. The consortium will eventually hold BHP Minerals' Gregory Mine, the coal mines of Central Queensland Coal Associates, and Utah International's Blackwater Mine and its Hay Point coal terminal. Reportedly, the financial arrangements will result in GE retaining a share in the consortium.

New South Wales remained Australia's largest coal-producing State with a record high 66.14 million tons, 2% over that of 1982, followed by Queensland with 48.9 million tons, also 2% over the 1982 production. These two States continued to account for about 95% of Australia's coal production and 100% of the country's coal exports. Western Australia ranked third among the coal-producing States, followed by South Australia and Tasmania, respectively. Victoria produced only lignite and the Northern Territory had no production of any type of coal.

Coal exports increased 21.5% over those of 1982, with both New South Wales and Queensland sharing in the growth, 28.3% and 19.8%, respectively. Japan continued to be the primary market, receiving 59.6% of total coal exports.

The Queensland coal mines were predominantly surface operations while underground mining predominated at the New South Wales operations, although opencut mines have been supplying an increasing percentage of New South Wales production over the last few years.

A consortium led by McIllwraith McEachan Ltd. purchased the Cook Colliery in central Queensland from BHP Minerals and signed a long-term sales contract for coal exports to the Republic of Korea. Australian Government approval was attained for two South Korean companies to hold a 40% interest in the mine. BHP Minerals had previously decided to close the mine.

Production commenced at M.I.M.'s Oakey Creek Mine in Queensland at midyear. The mine will produce 3 million tons per year of coking coal when full capacity is attained.

Petroleum and Natural Gas.—Production of crude petroleum increased 12%, natural gas rose 3%, and natural gas liquids increased 26% above 1982 levels. Australia's domestic oil production was about 420,000 barrels per day, a new record high, of which about 90% was from the Gippsland Field in the Bass Strait between the Australian mainland and Tasmania. Australia remained about 70% self-sufficient in crude oil production.

While slightly below the banner year of 1982, hydrocarbons exploration and development drilling continued at near-record-high levels, with 273 wells drilled. Of these, 211 were for exploration (162 onshore, 49 offshore) and 62 were for development (37 onshore, 25 offshore). However, the level of seismic activity dropped significantly, with only one-third of the line kilometers being shot. The drop in offshore activity was even more pronounced, being only about one-quarter of the 1982 level.

The joint venture led by BHP Petroleum Pty. Ltd. made perhaps the most significant oil find in more than a decade, since the discovery of the Bass Strait fields, in Australia in mid-1983. The wildcat Jabiru 1A well, 300 kilometers off the Western Australian coast in the Timor Sea, recorded a flow rate of 7,500 barrels per day, the highest test flow in Australian oil exploration history, in an October test without a choke. Preliminary estimates indicate the field contains 500 million barrels, of which 200 million barrels is recoverable. BHP Petroleum announced in late November that an extensive exploration program would be mounted in early 1984 to delineate the field.

The Australian Government announced early in 1983 its declared policy to introduce a profit-based resource rent tax, or "excess profits tax," on the country's hydrocarbons and minerals sectors by July 1, 1984. At yearend, the Government was focusing its efforts on the petroleum sector, and specifically the offshore production areas as these are under Federal, and not State, control.

Uranium.—Australian production of uranium oxide (U_3O_8) decreased 27% from that of the record-high level reached in 1982, largely owing to the closing of the Mary Kathleen Mine, majority owned by CRA, in September 1982, but also to lower production at Energy Resources of Australia Ltd.'s Ranger Mine and QML's operation at Nabarlek. The Ranger opencut uranium mine, in the Alligator Rivers region, Northern Territory, was the largest uranium producer in Australia during the year, with 2,581 tons of U_3O_8, and the second largest in the world behind Rossing Uranium Ltd. in Namibia. The nearby Nabarlek treatment plant produced 1,214 tons of U_3O_8 from stockpiled ore that was mined in one short but intense period of opencut mining spanning 4 months and 11 days in 1979. The mill's leaching cycle was modified during the year to allow for the use of Caro's acid, permonosulfuric acid, which tests showed had significant operating advantages over pyrolusite for leaching of the ore.

Minatome Australia Pty. Ltd. released its draft Environmental Impact Statement for Total Mining Australia Ltd.'s Ben Lomond uranium-molybdenum deposit in Queensland in March. The statement included a proposal to mine the western portion of the deposit by opencut methods and the eastern portion by underground methods. Total Mining continued with its plan to develop the deposits, although it appeared near yearend that the Government would not approve its development in the near future. On November 7, an ALP caucus voted the following:

1. With the exception of the Olympic Dam copper-uranium project at Roxby Downs, South Australia, should a commercial decision be made to proceed with the development of this mine, the development of any new uranium mines would not be permitted. Additionally, exports from Olympic Dam would be subject to whatever nuclear safeguard arrangements apply at the time of export.
2. An inquiry into Australia's role in the nuclear fuel cycle will be conducted by the Australian Science and Technology Council, with a report to the Government not later than mid-1984.
3. All future exports of Australian uranium under both existing and any future contracts will be subject to the most stringent supply conditions, which will be determined by the Government following the inquiry.
4. A permanent commission will be established to address, on an ongoing basis, the full range of issues relating to the nuclear fuel cycle, reporting on a regular basis to the Government.

As a result of the above decisions, all other potential projects under consideration, including Koongarra and Jabiluka in the Northern Territory, the latter perhaps being the largest known deposit in the

Western World; Ben Lomond in Queensland; Honeymoon and Beverley in South Australia; and Yeelirrie and Lake Way in Western Australia, have been stopped temporarily.

Australia had almost no domestic demand for uranium as no nuclear powerplants were in existence or on the drawing boards. Domestic uranium consumption was limited to minor amounts in medical, industrial, and scientific applications.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Australian dollars (A$) to U.S. dollars at the rate of A$1.00=US$0.893 as of Dec. 31, 1983.

[3] Australian Bureau of Statistics. Foreign Ownership and Control of the Mining Industry and Selected Mineral Processing Industries, Australia 1981-82, 18 pp.

The Mineral Industry of Austria

By George A. Rabchevsky[1]

Austria was a major producer of iron ore in 1983 by domestic standards, although the steel industry still required imports of ore. The country had a moderately large steel industry, which competed on the European export market, and was also a significant world producer of graphite, magnesite, and tungsten.

The gross domestic product (GDP) grew by 5.8%, at current prices, the second year of such growth since 1981. Real economic growth for 1983 was slightly over 1%. Unemployment rose slightly to 4.5%, or 565,000 workers, from 3.7% in 1982. Although the international steel crisis was mostly responsible for the unemployment, other industries, including quarrying and chemicals, also contributed to it. The economic impact of the steel crisis was felt particularly in the States of Styria and Lower Austria where several iron and steel producers and fabricators, all subsidiaries of the state-owned Voest-Alpine AG (VA), are located.

The metals mining and processing industries, however, did especially well, with gains registered by most commodities. The mineral fuels industry continued its predicted incremental decline for the fifth year. The value of selected construction materials amounted to $374 million, $270 million of which was from cement alone.[2]

Continued emphasis was placed on energy savings, rationalization, and restructuring efforts in the minerals processing industry. The Government, in seeking to minimize the employment reductions brought about by the restructuring, approved $891 million in aid to the nationalized industries, mainly steel, as compensation for losses incurred.

PRODUCTION

Overall industrial production, including the production of crude oil and refined petroleum, declined in 1983 for the second year. The Austrian Price Commission seriously considered eliminating price controls on petroleum products early in 1984 to stimulate consumption and production. Contrary to the general trend, almost all production by metal mines, except tungsten, showed a sizable increase. This also applied to the metals processing and manufacturing industries, of which secondary aluminum showed the highest gains. Nonmetals did not perform as well, except in a renewed increase in production of graphite, which jumped by 65%. The production of cement and construction materials also declined.

Table 1.—Austria: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983^{p}
METALS					
Aluminum metal:					
Primary	92,693	94,393	94,758	93,908	94,200
Secondary	41,984	31,926	46,343	39,066	56,785
Total	134,677	126,319	141,101	132,974	150,985
Antimony, mine output, metal content of concentrate	571	662	603	667	659
Cadmium metal	34	36	55	48	46
Copper:					
Smelter, secondary	21,800	26,100	27,100	30,000	28,000
Refined:					
Primary^{e}	8,812	^{r}9,303	^{r}9,117	^{r}8,559	8,839
Secondary	24,000	^{r}34,000	30,000	33,000	33,061
Total	32,812	^{r}43,303	39,117	41,559	41,900
Germanium, metal content of concentrates kilograms	4,500	4,500	4,000	4,000	5,600
Iron and steel:					
Iron ore and concentrates:					
Gross weight thousand tons	3,200	3,200	3,050	3,330	3,540
Metal content do	1,000	986	948	1,045	1,107
Metal:					
Pig iron do	3,702	3,485	3,476	3,115	3,320
Ferroalloys, electric-furnace do	9	10	12	14	11
Steel, crude do	4,917	4,624	4,656	4,258	4,411
Semimanufactures do	3,992	3,818	3,477	3,381	3,555
Lead:					
Mine output, metal content of concentrate	4,499	4,316	4,320	4,086	4,290
Metal: Smelter:					
Primary	5,981	5,418	3,343	3,410	^{e}3,130
Secondary	10,825	11,547	12,789	14,512	^{e}14,400
Total	16,806	16,965	16,132	17,922	17,530
Manganese, Mn content of domestic iron ore	58,969	47,216	55,876	61,549	65,284
Tungsten, mine output, metal content of concentrate	1,496	^{r}2,150	1,435	1,714	1,117
Zinc:					
Mine output, metal content of concentrate	20,539	19,117	18,181	19,065	19,432
Metal refined	23,238	22,102	22,674	23,000	23,000
NONMETALS					
Barite	305	249	--	--	--
Cement, hydraulic thousand tons	5,611	5,455	5,288	5,012	4,909
Clays:					
Illite	379,042	504,812	331,448	441,497	381,598
Kaolin:					
Crude	330,094	340,980	315,560	351,392	402,511
Marketable	78,553	83,882	79,064	77,288	83,359
Other	46,073	61,635	52,173	15,598	32,946
Feldspar, crude	6,594	10,946	10,357	2,960	1,063
Graphite, crude	40,519	36,699	23,807	24,451	40,418
Gypsum and anhydrite, crude	798,108	833,417	800,515	727,520	750,921
Lime thousand tons	^{r}932	^{r}1,005	1,034	1,027	1,140
Magnesite:					
Crude do	1,104	1,318	1,159	1,031	1,006
Sintered or dead-burned do	423	427	361	370	321
Caustic calcined do	121	132	102	98	89
Nitrogen: N content of ammonia do	520	490	486	485	^{e}480
Pigments, mineral: Micaceous iron oxide	12,298	10,959	11,320	9,570	11,734
Pumice (trass)	8,162	8,162	8,308	10,551	^{e}12,000
Salt:					
Rock thousand tons	1	1	1	1	1
In brine:					
Evaporated do	380	410	462	434	359
Other do	247	261	264	214	141
Total do	628	672	727	649	501
Sand and gravel:					
Quartz sand do	885	878	869	864	816
Other do	9,900	9,229	9,413	8,496	8,083
Total do	10,785	10,107	10,282	9,360	8,899

See footnotes at end of table.

Table 1.—Austria: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983^{p}
NONMETALS —Continued					
Sodium compounds, n.e.s.:^{e}					
Sodium carbonate, synthetic thousand tons	170	170	170	170	170
Sodium sulfate, synthetic do	55	55	55	55	55
Stone:[2]					
Dolomite do	1,014	1,017	1,227	1,029	938
Quartz and quartzite do	218	219	184	177	171
Other including limestone and marble do	13,042	13,105	12,897	11,080	10,629
Total do	^{r}14,274	^{r}14,341	14,308	12,286	11,738
Sulfur:					
Byproduct:					
Of metallurgy	9,644	8,731	9,133	9,504	9,429
Of petroleum and natural gas	23,989	18,733	27,861	38,243	31,355
From gypsum and anhydrite	27,102	23,836	25,143	27,102	26,122
Total	60,735	51,300	62,137	74,849	66,906
Talc and soapstone	116,420	116,708	116,425	117,092	122,128
MINERAL FUELS AND RELATED MATERIALS					
Coal, brown, and lignite thousand tons	2,741	2,865	3,061	3,297	3,041
Coke do	1,686	1,689	1,606	1,622	1,725
Gas, natural:					
Gross million cubic feet	81,647	67,211	50,730	46,758	42,850
Marketed do	68,790	55,443	41,835	38,088	^{e}35,150
Oil shale	1,160	950	970	1,010	^{e}1,000
Petroleum:					
Crude thousand 42-gallon barrels	12,039	10,290	9,324	8,994	8,842
Refinery products:					
Gasoline do	15,280	15,409	16,251	15,378	16,109
Kerosine and jet fuel do	957	1,053	1,242	1,059	1,079
Distillate fuel oil do	20,980	18,970	15,767	15,484	15,267
Residual fuel oil do	29,547	28,974	21,821	17,740	11,646
Lubricants do	1,214	1,070	767	538	603
Liquefied petroleum gas do	3,718	4,470	4,808	3,876	1,158
Bitumen do	2,286	2,173	1,657	1,605	^{e}1,600
Unspecified do	1,453	506	1,283	270	^{e}1,200
Refinery fuel and losses do	3,286	3,565	3,320	3,072	^{e}2,250
Total do	78,721	76,190	66,916	59,022	50,912

^{e}Estimated. ^{p}Preliminary. ^{r}Revised.

[1] Table includes data available through June 1984.

[2] Excluding stone used by the cement and iron and steel industries.

TRADE

Austria, as did many other European countries, depended heavily on foreign trade. Export growth leveled off in the second half of 1982 and was followed by stagnation in early 1983. However, exports picked up again during the second and third quarters of 1983. Export orders negotiated opened new markets for Austria and thus promised renewed economic growth. For example, VA was to provide $500 million worth of continuous casters for Bethlehem Steel Corp.; the state-owned diversified steel company will also be working on a luxury ship, barges, and a floating crane worth $75 million for the Soviet Union. The company also entered into a joint venture with Microsystems Inc. of California for the manufacture of microchips.[3]

Table 2.—Austria: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Scrap	56,371	51,406	--	West Germany 26,167; Italy 23,045.
Unwrought	24,968	27,635	--	West Germany 7,420; Japan 6,541.
Semimanufactures	64,611	68,667	1,614	West Germany 18,822; France 5,130.
Chromium: Ore and concentrate	109	49	--	All to West Germany.
Copper:				
Sulfate	2,158	24	--	All to Denmark.
Metal including alloys:				
Scrap	5,410	5,021	--	West Germany 3,174; Netherlands 651.
Unwrought	23,554	19,574	--	Italy 8,644; West Germany 7,480.
Semimanufactures	15,854	17,063	120	West Germany 5,477; Italy 4,313.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	11,317	19,130	NA	West Germany 11,960; Switzerland 3,922.
Iron and steel: Metal:				
Scrap	12,315	8,840	--	Italy 3,529; Switzerland 2,789.
Pig iron, cast iron, related materials	6,421	4,470	69	West Germany 1,235; Bulgaria 1,112.
Ferroalloys	10,575	12,085	289	Romania 2,700; Poland 1,515.
Steel, primary forms	405,900	276,759	3,362	West Germany 155,358; Italy 48,785.
Semimanufactures:				
Bars, rods, angles, shapes, sections	405,480	340,387	6,203	West Germany 89,601; Italy 81,261.
Universals, plates, sheets	1,374,159	1,296,220	3,059	U.S.S.R. 476,372; West Germany 328,517.
Hoop and strip	101,056	97,199	83	West Germany 29,925; U.S.S.R. 12,851.
Rails and accessories	80,919	88,870	550	Switzerland 21,421; Iran 12,547.
Wire	57,735	58,141	678	West Germany 26,255.
Tubes, pipes, fittings	286,187	307,510	58,011	West Germany 64,656; U.S.S.R. 34,923.
Casting and forgings, rough	14,227	14,584	427	West Germany 5,008; Italy 1,370.
Lead: Metal including alloys, unwrought	334	837	--	Hungary 600; West Germany 179.
Magnesium: Metal including alloys:				
Scrap	528	630	NA	West Germany 483; Italy 130.
Unwrought	275	133	--	All to West Germany.
Semimanufactures	430	495	NA	West Germany 336; Sweden 68.
Molybdenum: Metal including alloys, all forms	1,018	1,045	NA	NA.
Nickel: Metal including alloys:				
Scrap	451	255	--	West Germany 175; Switzerland 39.
Unwrought	105	8	--	Yugoslavia 7.
Semimanufactures	581	382	81	West Germany 123; Algeria 30.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	9,259	11,446	--	West Germany 8,102; Greece 1,736.
Rare-earth metals	275	378	52	West Germany 71; Italy 70; France 65.
Silver: Metal including alloys, unwrought and partly wrought thousand troy ounces	997	1,880	--	West Germany 1,169; Yugoslavia 584.
Tungsten: Metal including alloys, all forms	1,243	663	NA	NA.
Zinc:				
Oxides	678	1,306	--	Hungary 713; Yugoslavia 526.
Metal including alloys:				
Scrap	703	558	--	All to West Germany.
Unwrought	2,193	2,835	--	Yugoslavia 1,858; Czechoslovakia 500.
Semimanufactures	892	448	2	West Germany 165; Switzerland 114.
Other:				
Oxides and hydroxides	395	536	34	Italy 365; West Germany 65.
Ashes and residues	92,526	107,004	15	Italy 80,355; West Germany 20,984.
Waste and sweepings of precious metals value, thousands	$1,940	$4,846	NA	West Germany $3,634; France $650.
Base metals including alloys, all forms	603	704	19	Italy 449; United Kingdom 145.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	13,475	11,922	26	West Germany 1,809; Italy 1,045.
Cement	22,240	23,960	--	West Germany 12,751; Czechoslovakia 5,173.
Chalk	2,604	1,987	--	Hungary 1,521; Italy 203.
Clays, crude:				
Dinas earth	765	711	--	Hungary 539; Malaysia 49.
Kaolin	24,987	27,863	--	Hungary 13,978; Italy 10,095.

See footnotes at end of table.

Table 2.—Austria: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Diamond: Gem, not set or strung value, thousands	$349	$523	--	Switzerland $351; West Germany $156.
Fertilizer materials: Manufactured:				
Phosphatic	16,285	50,348	NA	Hungary 33,994; Czechoslovakia 15,830.
Unspecified and mixed	748,924	816,997	30	West Germany 439,038; East Germany 105,500.
Graphite, natural	14,640	13,384	11	Poland 5,214; West Germany 4,281.
Gypsum and plaster	191,836	166,522	--	West Germany 162,914.
Lime	1,173	1,727	--	West Germany 1,088; Hungary 550.
Magnesite	96,636	160,567	764	U.S.S.R. 48,000; West Germany 27,854.
Mica: Crude including splittings and waste	448	602	--	Yugoslavia 204; Greece 155.
Pigments, mineral:				
Natural, crude	7,047	7,683	53	West Germany 2,489; United Kingdom 1,813.
Iron oxides and hydroxides, processed	500	693	--	West Germany 478; Netherlands 212.
Precious and semiprecious stones other than diamond:				
Natural thousand carats	1,025	4,000	75	West Germany 2,155; Italy 120.
Synthetic do	6,315	14,150	2,160	India 7,020; West Germany 770.
Salt and brine	--	1,443	--	Czechoslovakia 1,201; Italy 170.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	1,777	3,307	--	Yugoslavia 2,906; Tanzania 400.
Sulfate, manufactured	68,369	73,349	1,196	Italy 25,136; West Germany 23,390.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	107,248	116,684	--	West Germany 96,075; Switzerland 20,336.
Worked	22,760	24,193	219	West Germany 12,740; Switzerland 10,793.
Dolomite, chiefly refractory-grade	4,965	4,165	--	West Germany 3,457; France 424.
Gravel and crushed rock	469,493	705,792	8	West Germany 373,713; Switzerland 319,928.
Limestone other than dimension	971	7,997	--	All to West Germany.
Quartz and quartzite	156	332	--	Czechoslovakia 276; Iraq 28.
Sand other than metal-bearing	187,914	157,374	--	Switzerland 77,823; West Germany 74,779.
Sulfur: Sulfuric acid	5,835	13,547	NA	Yugoslavia 10,618; Italy 1,935.
Talc, steatite, soapstone, pyrophyllite	101,322	98,656	217	West Germany 52,804; Italy 11,813.
Other:				
Crude	5,918	4,807	--	West Germany 3,757; Italy 315.
Slag and dross, not metal-bearing	108,887	139,773	--	West Germany 132,589; Italy 5,097.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	35	457	--	Switzerland 433.
Carbon: Carbon black	50	17	--	West Germany 16.
Coal: Lignite including briquets	19,556	15,349	--	West Germany 15,223.
Coke and semicoke	546	331	--	West Germany 295; Switzerland 34.
Gas, natural thousand cubic feet	424	--		
Peat including briquets and litter	2,087	5,359	--	Italy 4,099; Switzerland 685.
Petroleum:				
Crude 42-gallon barrels	51	7	--	All to West Germany.
Refinery products:				
Liquefied petroleum gas do	208,916	593,108	--	Italy 553,100; West Germany 28,002.
Gasoline do	38,395	116,977	--	West Germany 101,550.
Mineral jelly and wax do	141,740	194,712	--	Netherlands 142,691.
Kerosine and jet fuel do	86,924	20,569	--	West Germany 7,146; Hungary 4,022.
Distillate fuel oil do	2,111	7,139	--	Yugoslavia 5,916; Czechoslovakia 1,134.
Lubricants do	497,119	382,193	21	Czechoslovakia 173,187; Hungary 63,700.
Residual fuel oil do	992	38,828	--	Poland 38,035.
Bitumen and other residues do	24,028	89,591	--	Czechoslovakia 61,903; Poland 10,914.
Bituminous mixtures do	37,899	41,596	--	Algeria 15,823; West Germany 8,648.

NA Not available.

[1] Table prepared by Jozef Plachy.

Table 3.—Austria: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Alkali metals	^{r}81	59	--	West Germany 58.
Aluminum:				
Ore and concentrate	36,655	24,945	--	Guinea 16,884.
Oxides and hydroxides	274,413	219,984	555	Hungary 137,090; West Germany 71,091.
Metal including alloys:				
Scrap	68,023	67,352	642	U.S.S.R. 42,269; Hungary 7,769.
Unwrought	33,160	43,909	6	West Germany 24,356; Norway 6,157.
Semimanufactures	37,352	42,040	18	West Germany 17,721; Switzerland 7,119.
Antimony:				
Ore and concentrate	37	211	--	All from Canada.
Oxides	98	161	NA	U.S.S.R. 83; Belgium-Luxembourg 46.
Metal including alloys, all forms	52	48	NA	Belgium-Luxembourg 32; Bolivia 11.
Chromium:				
Ore and concentrate	42,334	49,906	--	Republic of South Africa 39,733.
Oxides and hydroxides	371	328	5	West Germany 178; U.S.S.R. 52.
Columbium and tantalum: Metal including alloys, all forms, tantalum	19	30	8	Belgium-Luxembourg 7; West Germany 7.
Copper:				
Sulfate	613	536	--	Italy 372; France 115.
Metal including alloys:				
Scrap	18,074	29,009	40	U.S.S.R. 12,339; West Germany 9,171.
Unwrought	12,975	15,407	42	West Germany 3,175; Chile 2,553.
Semimanufactures	63,183	56,352	55	West Germany 27,339; Italy 8,509.
Gold: Metal including alloys, unwrought and partly wrought ___ troy ounces	100,953	116,483	32	Republic of South Africa 58,097; West Germany 32,923.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	3,423	3,241	--	U.S.S.R. 937; Sweden 745; Canada 694.
Pyrite, roasted	45,515	33,962	--	Yugoslavia 15,058; West Germany 10,035.
Metal:				
Scrap	169,755	380,562	39	West Germany 129,702; Poland 103,513.
Pig iron, cast iron, related materials	81,995	77,847	51	U.S.S.R. 41,335; West Germany 9,786.
Ferroalloys:				
Ferrochromium	16,827	23,625	--	Yugoslavia 6,724; U.S.S.R. 4,930.
Ferromanganese	21,804	24,466	--	Norway 14,114; West Germany 5,935.
Ferrosilicon	13,368	14,413	--	Yugoslavia 6,228; U.S.S.R. 3,544.
Unspecified	11,329	9,088	3	West Germany 1,380; Czechoslovakia 1,363.
Steel, primary forms	181,564	142,291	35	West Germany 45,886; Hungary 32,210.
Semimanufactures:				
Bars, rods, angles, shapes, sections	232,755	229,781	13	West Germany 96,814; Italy 69,232.
Universals, plates, sheets	223,979	225,949	276	West Germany 108,712; Italy 22,626.
Hoop and strip	67,802	70,751	1	West Germany 47,969; Italy 6,805.
Rails and accessories	5,725	4,494	--	West Germany 2,471; Switzerland 1,121.
Wire	27,158	29,644	5	West Germany 10,628; Belgium-Luxembourg 7,732.
Tubes, pipes, fittings	155,902	148,717	98	West Germany 80,170; Italy 21,493.
Castings and forgings, rough	12,502	12,416	6	West Germany 8,935; Switzerland 1,227.
Lead:				
Ore and concentrate	1,728	6,993	--	Canada 5,550; Italy 1,393.
Oxides	1,009	1,080	--	West Germany 545; Netherlands 456.
Metal including alloys:				
Scrap	3,605	2,367	--	Switzerland 1,138; West Germany 660.
Unwrought	35,740	32,549	9	West Germany 14,213; Belgium-Luxembourg 6,226.
Semimanufactures	750	609	--	West Germany 549.
Magnesium: Metal including alloys:				
Unwrought	1,968	1,650	492	Italy 580; Norway 301.
Semimanufactures	159	147	7	West Germany 68; Italy 29.
Manganese: Ore and concentrate, metallurgical-grade	459	439	13	Australia 150; Netherlands 140.
Mercury ___ 76-pound flasks	441	290	--	West Germany 174; China 87.

See footnotes at end of table.

Table 3.—Austria: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Molybdenum:				
Oxides and hydroxides	1,493	1,896	NA	NA.
Metal including alloys, scrap	182	4	NA	West Germany 2; Yugoslavia 1.
Nickel:				
Matte and speiss	734	833	244	Cuba 324; Netherlands 203.
Metal including alloys:				
Scrap	567	357	92	West Germany 138; Netherlands 68.
Unwrought	2,586	1,129	342	Canada 359; Republic of South Africa 278.
Semimanufactures	429	534	53	West Germany 349; United Kingdom 61.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	24,274	28,711	NA	West Germany 21,123; Switzerland 5,112.
Rare-earth metals	3	149	NA	West Germany 112; Japan 17.
Silver:				
Waste and sweepings value, thousands	$1,235	$22	--	All from Yugoslavia.
Metal including alloys, unwrought and partly wrought thousand troy ounces	5,859	7,048	678	West Germany 3,791; Switzerland 1,020.
Tin: Metal including alloys:				
Unwrought	410	455	1	West Germany 164; Bolivia 85.
Semimanufactures	130	182	2	West Germany 146; Netherlands 18.
Tungsten:				
Ore and concentrate	3,425	2,413	18	Australia 1,377; France 286.
Oxides and hydroxides	160	70	NA	NA.
Metal including alloys:				
Scrap	274	248	65	Canada 65; West Germany 59.
Unwrought	^{r}113	58	12	Republic of Korea 26; West Germany 12.
Zinc:				
Ore and concentrate	7,721	9,323	--	Italy 8,106; Czechoslovakia 1,216.
Oxides	893	951	(2)	West Germany 897; Italy 30.
Blue powder	1,838	945	--	Belgium-Luxembourg 408; West Germany 182.
Metal including alloys:				
Unwrought	4,461	4,114	--	West Germany 3,483; France 143.
Semimanufactures	1,153	1,821	--	West Germany 1,128; France 386.
Other:				
Ores and concentrates	10,682	11,218	1,416	Netherlands 3,870; Republic of South Africa 1,754.
Oxides and hydroxides	2,376	1,153	22	China 669; France 198.
Ashes and residues	137,135	168,128	481	U.S.S.R. 103,614; East Germany 22,228.
Waste and sweepings of precious metals value	$133,233	$75,620	--	Denmark $71,374.
Base metals including alloys, all forms	4,483	3,729	110	U.S.S.R. 2,421.
NONMETALS				
Abrasives, n.e.s.:				
Artificial:				
Corundum	9,454	9,666	464	West Germany 4,302; France 3,170.
Silicon carbide	2,834	2,583	NA	West Germany 1,451; Norway 405.
Dust and powder of precious and semiprecious stones including diamond kilograms	269	348	309	Switzerland 20; West Germany 14.
Asbestos, crude	26,643	27,082	103	Canada 13,302; U.S.S.R. 5,161.
Barite and witherite	8,273	6,649	--	West Germany 2,645; Czechoslovakia 2,218.
Boron materials: Crude natural borates	20,985	17,028	5,850	Turkey 11,154.
Cement	40,298	38,428	--	West Germany 10,149; Belgium-Luxembourg 8,549.
Chalk	7,753	3,177	--	France 1,894; West Germany 864.
Clays, crude:				
Bentonite	954	839	NA	West Germany 581.
Chamotte earth	17,772	15,240	NA	Czechoslovakia 14,103.
Kaolin	110,723	94,299	8,199	Czechoslovakia 34,396; United Kingdom 29,355.
Unspecified	90,975	78,793	144	West Germany 52,985; Czechoslovakia 17,843.

See footnotes at end of table.

Table 3.—Austria: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Diamond:				
Gem, not set or strung value, thousands	$6,337	$4,728	$133	Israel $1,695; Belgium-Luxembourg $1,633.
Industrial do	$236	$358	$2	Republic of South Africa $125; West Germany $110.
Diatomite and other infusorial earth	8,007	7,958	1,170	Czechoslovakia 2,058; Hungary 1,944.
Feldspar	5,893	5,095	--	Sweden 2,509; West Germany 2,064.
Fertilizer materials:				
Crude, n.e.s	3,742	3,978	--	West Germany 2,014; Italy 1,669.
Manufactured:				
Ammonia	27,056	8,036	--	Romania 4,231; Czechoslovakia 1,949.
Nitrogenous	75,096	118,135	NA	West Germany 46,740; Hungary 26,379.
Phosphatic	89,252	79,771	1,202	France 46,165; West Germany 17,565.
Potassic	267,697	261,875	NA	NA.
Unspecified and mixed	137,218	147,886	3,808	West Germany 116,611; Italy 19,243.
Fluorspar	13,001	10,617	--	East Germany 5,677; West Germany 4,153.
Graphite, natural	1,056	2,653	1	North Korea 1,061; China 789.
Gypsum and plaster	11,968	9,627	20	West Germany 9,057; Italy 474.
Lime	2,657	4,306	--	Yugoslavia 3,383; West Germany 467.
Magnesium compounds:				
Magnesite	[r]99,975	97,529	2	Italy 22,589; Turkey 20,696.
Oxides and hydroxides	4,516	2,165	--	Norway 868; West Germany 593.
Mica: Crude including splittings and waste	231	222	--	West Germany 118; Norway 52.
Nitrates, crude	--	1,142	--	All from West Germany.
Phosphates, crude	410,412	351,615	141,262	Israel 67,191; Morocco 57,990.
Pigments, mineral:				
Natural, crude	346	2,035	--	France 1,352; Spain 670.
Iron oxides and hydroxides, processed	3,317	3,279		West Germany 3,171; France 25.
Potassium salts, crude	13,531	10,963	--	West Germany 10,377; East Germany 586.
Precious and semiprecious stones other than diamond:				
Natural thousand carats	27,975	21,010	265	West Germany 7,735; Brazil 5,120.
Synthetic do	46,175	71,100	9,425	Switzerland 36,195; France 16,530.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	1,931	1,297	NA	East Germany 710; Poland 404.
Sulfate, manufactured	444	232	--	West Germany 168; Switzerland 64.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	42,612	36,284	--	Italy 20,560.
Worked	40,510	38,713	--	Italy 27,781; West Germany 6,137.
Dolomite, chiefly refractory-grade	3,422	3,240	--	Italy 2,201; West Germany 712.
Gravel and crushed rock	241,649	258,387	--	West Germany 224,438; Italy 17,975.
Quartz and quartzite	32,451	34,701	--	Hungary 20,976; West Germany 12,598.
Sand other than metal-bearing	470,397	444,378	2	West Germany 238,912; Czechoslovakia 164,686.
Sulfur:				
Elemental: Crude including native and byproduct	102,818	84,658	--	West Germany 39,080; Poland 35,417.
Sulfuric acid	24,290	19,492	--	West Germany 14,435; Hungary 4,534.
Talc, steatite, soapstone, pyrophyllite	1,674	2,623	--	France 979; Norway 698.
Other:				
Crude	67,645	71,210	2,133	West Germany 26,326; Hungary 22,061.
Slag and dross, not metal-bearing	25,828	29,352	83	Italy 18,539; West Germany 5,795.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,708	1,779	10	Trinidad and Tobago 1,359.
Carbon: Carbon black	24,829	26,211	238	West Germany 14,176; Italy 8,653.
Coal:				
Anthracite thousand tons	53	18	--	U.S.S.R. 12; West Germany 5.
Bituminous do	2,661	2,834	804	Czechoslovakia 827; Poland 773.
Briquets of anthracite and bituminous coal do	30	25	--	West Germany 22.
Lignite including briquets do	863	1,047	--	Yugoslavia 501; East Germany 364.
Coke and semicoke do	987	874	--	Czechoslovakia 309; West Germany 202.
Gas, natural million cubic feet	141,212	106,870	--	U.S.S.R. 104,573.
Peat including briquets and litter	65,243	65,491	--	West Germany 41,230; U.S.S.R. 16,069.

See footnotes at end of table.

Table 3.—Austria: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum:				
Crude thousand 42-gallon barrels	55,856	45,479	--	Saudi Arabia 14,151; U.S.S.R. 10,475; Libya 8,750.
Refinery products:				
Liquefied petroleum gas do.	610	610	1	West Germany 433; Hungary 57.
Gasoline do.	4,820	5,181	(2)	West Germany 2,715; Italy 1,992.
Mineral jelly and wax do.	118	103	1	West Germany 72; Hungary 10.
Kerosine and jet fuel do.	37	68	(2)	Italy 30; West Germany 23.
Distillate fuel oil do.	1,833	1,773	(2)	West Germany 856; Czechoslovakia 315.
Lubricants do.	1,881	1,919	5	Czechoslovakia 609; Hungary 315.
Residual fuel oil do.	6,638	7,495	--	West Germany 2,296; Czechoslovakia 1,397.
Bitumen and other residues do.	1,538	1,500	--	West Germany 603; Italy 487.
Bituminous mixtures do.	42	38	(2)	West Germany 26.
Petroleum coke do.	207	415	214	West Germany 175.

[r] Revised. NA Not available.
[1] Table prepared by Jozef Plachy.
[2] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Antimony.—Of the four producers of antimony in Western Europe, Austria was the second largest after France, and ahead of Spain and Italy. Bleiberger Bergwerks-Union AG was the only producer in Austria with mining operations located at Stadt Schlaining in Burgenland in the southwest where stibnite, the antimony mineral, occurs disseminated in graphite schists as small lenses and veins interbedded with limestone and chlorite schists. In 1982, there were 151 workers at the mine, of which 11 were administrative employees. The state-owned company's capacity was over 28,000 tons of antimony ore annually and about 1,000 tons of concentrate. The antimony produced was used solely at Bleiberger's own chemical and metallurgical plant for the production of alloys and antimony derivatives.

Iron and Steel.—Although Austria's iron and steel industry faced problems similar to those of other major Western producers, such as excess capacity, increased foreign competition, and weak prices, the overall 1983 production of iron and steel increased. Nevertheless, the iron and steel industry operated at a loss under the direction of the state-owned VA. Subsidies and other financial aid since 1970 have reportedly surpassed $1 billion to help cover losses while the industry was undergoing major modernization, restructuring, and diversification. Vereinigte Edelstahlwerke AG (VEW), a subsidiary of VA and a prominent specialty steel producer, was particularly affected by unfavorable market conditions in the past several years. VEW was to reduce its annual steel capacity from 280,000 tons to about 125,000 tons by 1983, or by about 45%. About 520,000 tons, or 12% of the country's overall steel output, including the output of VEW, was specialty steel of all grades.

The steel industry continued to adopt cost-saving technologies, such as continuous casting. In 1983, more than 75% of steel was produced by this method, in contrast to 60% in 1981. VA in 1983 also began trial runs of its first primary plasma furnace at its plant in Linz. The $5.5 million furnace, based on technology from the German Democratic Republic's Freital Works, was the largest in the world at a capacity of 45 to 60 tons.

In the last 10 years, industry efforts have aimed at improving its competitive position by reducing manufacturing costs. As a result of these measures, the number of blast furnaces in Austria was reduced from 9 to 4, electric furnaces declined from 34 to 15, and the last of 10 open hearth furnaces in operation 10 years ago was shut down late in 1982. The number of operational basic oxygen furnaces remained unchanged at eight units. The number of rolling mills has declined from 33 units in the early seventies to 22 units in 1983. However, these measures did not proportionately reduce the available capacity. For example, the present 8 basic oxygen furnaces have a combined total capacity exceeding that of the 8 furnaces in operation 10 years ago by 32%; each of the 15 electric furnaces has a capacity that is about 105% larger than that of any 1 of the 34 units in operation in the early seventies.

Austria operated only one surface iron mine at Erzberg, the largest in Europe.[4] The ore from Erzberg was delivered by rail to VA's steel mills in Donawitz and Linz for production of self-fluxing sinter averaging 50% iron with 3% manganese. The ore grade and the tonnages, however, were insufficient to meet domestic demand, and Austria imported more than one-half of its iron ore. In 1982, the quantity of iron ore delivered to Austrian blast furnaces ran to 6.7 million tons, of which 49.7% came from the domestic steel industry's own mining operations; the balance was imported. In terms of iron content, the ratio of domestic to imported iron ore was 34.5:65.5. The bulk of iron ore was imported from Austria's traditional supplier countries: the Soviet Union, 937,000 tons; Sweden, 745,000 tons; Canada, 694,000 tons; and Brazil, 692,000 tons.

Most of Austria's steel was exported in finished forms, including that to the United States. Under an agreement, and as a result of complaints lodged by the United States against Austria, Austria began to limit its deliveries of specialty steel to the United States to an annual quota of 2,400 tons, as imports of U.S. steel mill products also declined.

The United States recently concluded an Orderly Marketing Agreement (OMA) with Austria for specialty steel. As a result of a suit by the U.S. steel industry and the U.S. Steelworkers Federation, it was asserted that market gains achieved in the United States by Austrian (and other foreign) suppliers were attributable almost solely to practices inconsistent with U.S. law and Austria's obligations under General Agreement on Tariffs and Trade (GATT). The OMA was negotiated on the instruction of the President of the United States as the means to implement the import program for specialty steel. The OMA established an annual quota of 2,400 tons for Austria's future exports of specialty steel to the United States. Furthermore, it settled possible GATT proceedings and established a consultive mechanism for the two countries.

Lead and Zinc.—All of Austria's lead-zinc mining and smelting was concentrated in the southern State of Carinthia, with mining at Villach and smelting at Arnoldstein. Mining has been decreasing for a number of years, although in 1983 it again reached the 1980 level. The production of lead, more than that of zinc, continued its decline, and the production of secondary smelter lead was increased at the expense of the primary.

Bleiberger, the only producer, continued exploration and evaluation of local reserves.[5]

Tungsten.—The mine at Mittersill near Salzburg was the only tungsten producer in Austria and was also Europe's largest. The mine accounted for 30% of total tungsten output in Europe. The mine employed 86 employees in 1982, of which 57 were laborers. The miners worked an 8-hour shift 250 days per year. The open pit is at an elevation of 7,590 feet, and because of heavy snowfall operated only from June to October, while the underground mine operated continuously. The mine is owned and operated by Wolfram Bergbau- und Hüttengesellschaft mbH, in which VA held 47.5% interest and Metallgesellschaft AG of the Federal Republic of Germany 47.5%; the remaining 5% was held by Teledyne Inc. of the United States.

The ore continued to be extracted both by surface mining and underground operations. In 1983, ore production was about 200,000 tons from the open pit at Ostfeld and 220,000 tons from the underground mine at nearby Westfeld. By 1984, the open pit was expected to be mined out, so that by 1985 about 400,000 tons should come from the underground mine. In 1983, an underground crusher and a 1.6-mile-long conveyor belt system was being completed, for operation at yearend 1984. Production was anticipated to continue at about the 1979 level of 1,496 tons for at least another 3 years. Consumption of tungsten in Austria has increased almost three times since 1975, the year the mine opened.

NONMETALS

Calcium Carbonate.—Generally, the majority of calcium carbonate producers in Western Europe restrict production facilities to their country of origin, although exceptions do occur. The largest producer of precipitated calcium carbonate (PCC) in

Europe, for example, the Solvay Group, had no PCC production facilities in Belgium where it is headquartered, but has operations in Austria, France, and the Federal Republic of Germany. The production of calcium carbonate fillers in Austria was dominated by two companies, Algobel-Werke Brandner GmbH (AWB), and Gersheim GmbH. AWB operated a calcite mine at Kainach with 50,000 tons annual capacity, and another at Salla with 40,000 tons. Various grades of calcite were produced, such as granules, coarse fillers, fine fillers, and slurries used in the paint, plastic, paper, and construction industries. Gersheim, a subsidiary of Pleuss-Staufer AG of Switzerland, operated a quarry and a processing plant at Gummern. Also in Austria, Ebenseer Solvay-Werke AG, a member of the Solvay Group of Belgium, produced PCC at Ebensee.[6]

Gypsum.—The Austrian gypsum industry is relatively young. There were 13 gypsum works prior to World War I, but only 3 remained by 1937. The building boom that followed World War II, however, resurrected the industry, and by 1954, Chemie Linz AG was producing about 400,000 tons. By 1973, the combined output of crude gypsum and anhydrite reached almost 900,000 tons, but because of overcapacity, the production has stabilized to a yearly average of about 750,000 tons. In 1983, there were eight operational gypsum works and mines distributed along the northern Calcareous Alps. Two of the companies also mined anhydrite.[7]

Table 4.—Austria: Gypsum plants and mines in 1983

Company	Operation	Location	Capacity (metric tons)
Rigips Austria GmbH (formerly Schottwiener Gipswerke AG).	Surface mine and plant.	Puchberg	55,000 tons of gypsum and anhydrite.
	Underground mine	Grundlsee near Wienern	200,000 tons of gypsum and anhdrite.
	Plant	Bad Aussee	
Erste Salzburger Gipswerkes-Gesellschaft Christian Moldan KG.	Underground mine	Moldan (Webing/Abtenau)	100,000 tons of gypsum.
	Surface mine and plant.	Moldan-Moosegg	200,000 tons of gypsum and anhydrite.
Gebr. Knauf & Co., Gips-und Gipsplattenwerk GmbH.	Surface mine	Spital an Pyhrn	80,000 tons of gypsum.
	Plant	Weissenbach	
Gipsbergbau Preinsfeld GmbH (a subsidiary of Perlmooser Zementwerke AG).	Underground mine	Near Heligenkreuz	50,000 tons of gypsum, all destined for the cement industry.
Gipsbergbau Tragoss-Oberort AG (a subsidiary of Gipswerke S. Saf. GmbH).	Surface mine	Oberort	35,000 tons of gypsum, all for the cement industry; anhydrite is also mined at times.
Gipswerke Schretter & Cie GmbH	do	Weissenbach	30,000 tons of gypsum.
Gipsbergbau Admont AG (a subsidiary of Franz Deisl GmbH).	do	Near Ardning	25,000 tons of gypsum.

Magnesite.—Austria had a vital and reliable magnesite industry, Tiroler Magnesite AG being the largest producer. There were three other operating companies, and among the four companies there were five working mines and six calcining plants. In 1982, the mines employed 280 workers, and the plants, 3,504 workers. Most of the ore, or 56%, was mined underground. The second largest producer, Österreichisch-Amerikanische Magnesit AG (OAMAG) celebrated its 75th anniversary in 1983. Its only mine at Radenthein had the capacity to produce 284,000 tons of crude magnesite and 55,000 tons of sinter.[8] OAMAG was totally owned by General Refractories Co. of the United States.

Sand (Silica).—The major silica sand producer in Austria was Quarzwerke GmbH, part of the Quarzwerke Group of the Federal Republic of Germany, which in turn was an associate of SCR-Sibelco SA of Belgium. The company operated a plant at Zelking in the Lower Austria State and another at St. Georgen in Upper Austria State. Both quarries mined fluvial Oligocene deposits with high feldspar and silica sand contents. The plant feed was washed and sieved, passed through attrition scrubbers, floated, classified in upward-current classifiers, and dried on fluid-bed or rotary driers. The plants had a washing capacity of about 300,000 tons and a flotation capacity of 130,000 tons. About 18% of the Austrian silica sand requirements of about 850,000 tons was imported. Natural sand for industrial and construction uses was also imported from and exported to the Federal Republic of Germany.

MINERAL FUELS

Austria's production of crude oil, natural gas, and coal continued to decline, while imports of some petroleum products decreased also. The main reasons for the decline in energy demand have been the more rational use of energy in response to high energy costs, effects of energy conservation measures, and weather conditions. About 75% of Austria's total energy requirements were met through imports of crude oil, and in 1983, these were at substantially higher prices than a decade earlier. The cost of imported petroleum and petroleum products rose from $278 million in 1972 to $2.1 billion in 1982, although the quantitative increase was only 3%. The cost of petroleum products equaled 3% of Austria's GNP.

In 1983, Austria's total energy consumption amounted to 899 petajoules, corresponding to 21.3 million tons of crude oil.[9]

Österreichische Mineralölverwaltungs AG (OMV) was the sole Austrian Government-owned company that dealt with oil and gas. Rohöl-Aufsuchungs GmbH, a subsidiary of Mobil Oil Co. and Shell Oil Co., was the only other oil and gas producer that was active in Austria.

Austria did not generate nuclear power; its only plant at Zwentendorf was mothballed after a national referendum in 1978. Instead, construction on a coal-fired plant at Duernrohr, close to the Zwentendorf plant, to cost about $600 million, was started, and the Hainburg plant, near Vienna on the Danube, was also reactivated. Both projects had been stopped because of environmental opposition. There were also six other plants located on the Danube River in 1983.

Coal.—Austria produced only lignite, whose output has remained stable at about 3 million tons annually. Prospecting, exploration, and production were subsidized by the Austrian and State (Länder) governments. About $1.4 million was invested in exploration, 60% of which was provided by the governments, with little hope, however, of locating new deposits.

The indigenous production was protected by an import licensing system, under which imports are allowed if the requirements could not be met domestically. As there was no considerable international market for lignite, this was mainly a measure of regulating lignite imports from neighboring centrally planned economy countries.

Natural Gas.—Most of Austria's domestic natural gas was produced in the Vienna Basin. Gas reserves were estimated at over 374 billion cubic feet early in 1983. During the year, production declined drastically, to about one-third of the consumption of 152 billion cubic feet of gas per year. It was estimated that in 1985 75% of gas requirements will be imported, and 80%, by 1990. As part of the extension of the existing 1982 contract, additional quantities of gas imports from the Soviet Union have been contracted for:[10]

1. Contract No. 1 was signed on June 1, 1958, for delivery of 53.0 billion cubic feet of gas per year. The duration of the contract was 23 years, from 1968 to 1990, and could be extended by 10 years to the year 2000. The price was $14.10 per cubic meter, in effect for a 7-year period, from 1968 through 1974. The price was determined on the basis of an index comprising price data of crude oil, residual fuel, and distillate heating oil.

2. Contract No. 2 was signed on November 25, 1974, for 17.7 billion cubic feet, for 23 years, from January 1, 1978, through December 31, 2000. The price was not disclosed but was determined on the same basis as contract No. 1.

3. Contract No. 3 was signed on August 22, 1975, for an additional 17.7 billion cubic feet, for 23 years, from January 1, 1978, through December 31, 2000, the same period as contract No. 2. According to the third contract, annual deliveries in 1975 and 1978 were about 8.8 billion cubic feet each. The same price provision applied as for contract Nos. 1 and 2.

4. Contract No. 4 was to be signed on March 30, 1984, for an additional 53.0 billion cubic feet of gas, for the duration of 25 years, from January 1, 1984, through December 31, 2000. Deliveries were to start in the second half of 1984 with an initial quantity of 8.8 billion cubic feet, with full quantity to be reached by the year 1989.

Petroleum.—Petroleum deposits occur, together with natural gas, in the Vienna

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Basin. In early 1983, the reserves were estimated at 130 million barrels. The production of crude oil has been declining now for a number of years, and in 1983, the domestic industry supplied only about 12% of the country's consumption. The state-owned OMV produced most of the oil and did most of the oil and gas exploration. In 1982, 478,500 feet was drilled, which included 39 completed wells and 38 exploratory wells. In May 1983, OMV had reportedly broken the Western Europe drilling record when it reached 28,031 feet at its Zisterdorf UT2a well.

OMV's only refinery at Schwechat operated at 50% capacity, refining 75% of domestic consumption, an increase of 2% over that of 1982.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Austrian schillings (AS) to U.S. dollars at the rate of AS17.96=US$1.00, the average rate in 1983.

[3] The Journal of Commerce (New York). Austria, 200 Years of Trade with U.S. Mar. 20, 1984, pp. 1c-8c.

[4] Von Reiter, H., O. Klobassa, and V. Schifko. Technische Entwicklung am Steirischen Erzberg (Technical Development at a Steirmark Ore Mountain). Berg. Hüttenmänn. Monatsh. (Vienna), No. 2, 1984, pp. 41-46.

Skillings, D. N., Jr. Styrian Erzberg One of Europe's Leading Ore Mines. Skillings' Min. Rev., v. 73, No. 19, May 12, 1984, pp. 8-13.

[5] Von Jedlicka, K. Haldenerzgewinnung und- Verarbeitung beim Bergbau Bleiberg/Kreuth der Bleiberger Bergwerksunion AG. (Processing of Rock Waste and Tailings at the Bleiberg-Kreuth Mine). Berg. Hüttenmänn. Monatsh. (Vienna), No. 12, 1983, pp. 477-483.

[6] Industrial Minerals (London). Producers of Calcium Carbonate Fillers. No. 198, Mar. 11, 1984.

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The Mineral Industry of Belgium-Luxembourg

By George A. Rabchevsky[1]

BELGIUM

The mining industry of Belgium contributed little to the country's gross national product (GNP). Except for industrial minerals and some coal, no revenues were generated from mining. The minerals processing industry, however, was a significant contributor to the Belgian GNP. As in previous years, the traditional strength of the Belgian economy was in transforming imported raw materials into finished products for export. The largest revenues were registered by the metals processing industry, although these were less than in 1982. In 1983, extracted minerals were valued at about $500 million,[2] most of it being coal. The metals processing and refinery industry contributed about $3 billion, and metal manufactured products contributed about $22 billion, compared with a GNP of over $80 billion.

The Belgian economy was in transition. The continuation of the austerity policy implemented in 1982 and the expected stronger European recovery were to contribute to the growth of Belgium's GNP in 1983. In general, however, the real GNP continued, virtually stagnant, after a decline of 0.7% in 1982, principally because the failure of world trade to expand has limited the growth of Belgian exports. Although Belgium has traditionally been a low inflation country, inflation was 8% in 1982, the year of the devaluation of the Belgian franc, and fell to about 7.5% in 1983. The 1983 budget deficit was about 13% of the GNP, down just slightly from the 1982 level. Unemployment remained a number one problem for the country, and stood at the alltime high of 15%, the highest of the European Economic Community (EEC) countries. This was attributed partly to layoffs in the steel and transportation industries, mostly seaport facilities.

PRODUCTION

Industrial production increased about 2.2%, only 0.01% higher than in 1982. As in other years, however, there was a drop in mineral industry production, but the aluminum and steel sectors showed modest increases. As in other years, steel, coal, glass, and construction material industries were the major contributors to the GNP. Belgium was also a significant refiner of petroleum.

During 1982, the latest year for which statistics are available, 1.1 million workers, or almost 11% of the population, were employed by industry, including the mining and energy sectors. Employment in the minerals and metals industries was as follows: steel, 41,816 workers; nonferrous metals and alloys, 13,494; quarries, 3,487; cement plants, 3,075; and nonmetallics 36,661. The coal industry had 19,611 workers; coking plants, 2,941; and petroleum refineries, 2,656. Overall, there was a slight decline from 1981 in those categories.

Table 1.—Belgium: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982^{p}	1983^{e}
METALS					
Aluminum metal	^{r}4,596	^{r}4,056	3,408	4,188	5,410
Cadmium, smelter	1,440	^{r}1,524	1,176	996	800
Copper:					
Blister:^{e}					
Primary	1,500	700	^{r}3,100	^{r}2,500	2,200
Secondary	47,800	49,300	47,500	47,500	47,000
Total	49,300	50,000	^{r}50,600	^{r}50,000	49,200
Refined, primary and secondary, including alloys	368,800	373,700	28,493	457,800	455,000
Iron and steel:					
Pig iron thousand tons	10,776	10,536	9,729	7,836	[3]7,999
Ferroalloys: Electric furnace ferromanganese do.	90	85	90	^{e}90	90
Steel:					
Crude do.	^{r}13,553	^{r}12,324	12,286	9,900	[3]10,155
Semimanufactures do.	10,356	9,552	8,892	7,364	6,400
Lead metal:					
Smelter:^{e}					
Primary[4]	33,700	53,900	60,200	^{r}52,950	53,000
Secondary[5]	27,000	30,000	28,000	^{r}28,020	[3]28,000
Total	60,700	83,900	88,200	^{r}80,970	81,000
Refined:					
Primary	65,200	75,900	73,900	66,000	65,000
Secondary[6]	48,212	52,008	36,032	33,720	30,045
Total[6]	113,412	127,908	109,932	99,720	95,045
Selenium^{e}	60	60	60	60	60
Tin metal:					
Primary	2,240	2,822	65	--	--
Secondary	12,500	2,230	2,443	2,208	1,620
Total	14,740	5,052	2,508	2,208	1,620
Zinc:					
Slab zinc:					
Primary	^{r}252,600	^{r}247,600	240,204	228,300	[3]262,600
Secondary (remelted zinc)	^{r}9,120	^{r}1,616	10,200	12,552	13,245
Total	^{r}261,720	^{r}249,216	250,404	240,852	[3]275,845
Zinc powder	^{r}27,384	^{r}30,120	26,208	23,532	18,110
Other, nonferrous: Precious metals, unworked, n.e.s.[7] thousand troy ounces	^{r}30,630	^{r}52,123	37,563	33,237	35,000
NONMETALS					
Barite^{e}	--	29,900	39,900	39,900	39,900
Cement, hydraulic thousand tons	7,703	7,482	6,691	6,321	5,410
Clays: Kaolin do.	^{r}65	^{r}61	54	53	50
Gypsum and anhydrite, calcined	192,936	^{r}174,084	154,428	140,000	135,000
Lime and dead-burned dolomite:					
Quicklime thousand tons	2,484	2,328	2,004	1,368	1,470
Dead-burned dolomite do.	164	165	148	159	160
Nitrogen: N content of ammonia do.	530	^{r}542	589	509	380
Phosphates: Thomas slag, gross weight do.	1,052	893	496	393	250
Sodium compounds:					
Sodium carbonate	400,248	326,928	273,000	327,648	256,400
Sodium sulfate^{e}	250,000	250,000	250,000	250,000	250,000
Stone, sand and gravel:					
Calcareous:					
Dolomite thousand tons	3,354	^{r}3,224	2,697	2,581	2,640
Limestone do.	^{r}27,468	^{r}29,664	27,588	24,660	21,060
Marble:					
In blocks cubic meters	4,368	^{r}4,452	5,976	7,848	2,100
Crushed and other	456	^{r}996	312	108	100
Petit granite (Belgian bluestone):					
Quarried thousand cubic meters	688	878	804	626	530
Sawed do.	65	72	63	56	45
Worked do.	^{r}9	10	9	8	8
Crushed and other do.	673	955	807	610	540
Porphyry, all types thousand tons	^{r}4,654	^{r}5,648	5,096	5,036	4,080
Quartz and quartzite	244,580	222,863	193,417	216,643	200,000

See footnotes at end of table.

Table 1.—Belgium: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Stone, sand and gravel —Continued					
Sandstone:					
Rough stone including crushed thousand tons	[r]2,493	[r]2,276	2,014	2,036	1,900
Paving	[r]22,692	[r]21,960	15,264	11,112	9,400
Sand and gravel:					
Construction sand thousand tons	[r]8,280	[r]7,584	6,516	6,348	6,500
Foundry sand do.	[r]912	[r]768	660	624	530
Dredged sand do.	1,050	2,183	889	1,244	1,160
Glass sand do.	[r]1,824	[r]1,992	1,860	1,716	1,600
Other sand do.	[r]1,728	[r]1,716	1,332	1,572	1,500
Gravel, dredged do.	[r]4,968	4,452	4,284	3,984	4,300
Sulfur, byproduct:[e]					
Elemental do.	110	110	110	110	110
Other forms do.	160	160	160	160	160
Total do.	270	270	270	270	270
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[e]	2,000	2,000	2,000	2,000	2,000
Coal:					
Anthracite thousand tons	511	375	321	262	250
Bituminous do.	5,614	5,949	5,815	6,277	5,750
Total do.	6,125	6,324	6,136	6,539	6,000
Coke, all types do.	[r]5,568	6,048	6,000	5,220	4,900
Fuel briquets, all kinds do.	[r]126	82	54	50	45
Gas:					
Manufactured million cubic feet	25,786	[r]23,820	24,371	20,987	21,430
Natural do.	1,389	1,352	1,342	1,236	1,230
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	43,288	46,801	40,571	31,243	32,900
Jet fuel do.	12,120	13,656	14,264	13,492	10,800
Kerosine do.	1,116	178	256	295	250
Distillate fuel oil do.	88,043	75,704	65,469	59,277	57,800
Residual fuel oil do.	62,045	61,672	55,648	47,271	26,800
Lubricants do.	686	440	280	300	300
Other do.	27,207	25,837	28,223	26,210	25,000
Refinery fuel and losses do.	12,096	14,840	14,304	10,680	12,500
Total do.	246,601	239,128	219,015	188,768	166,350

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through Apr. 2, 1984.

[2] In addition to the commodities listed, Belgium produces a number of other metals for which only aggregate output figures are available.

[3] Reported figure.

[4] Data not reported; derived by taking reported primary lead output plus exports of lead bullion, minus imports of lead bullion.

[5] Data represents secondary refined lead output minus remelted lead: as such the figures are probably high, because they include some lead that was sufficiently pure as scrap that did not require resmelting, but information is inadequate to permit differentation.

[6] Includes remelted lead, as follows in metric tons: 1979—21,200; 1980—22,000; 1981—8,000; 1982—5,700; and 1983—5,000 (estimated).

[7] Known to include gold, silver and platinum-group metals.

TRADE

Seventy percent of total Belgian production was exported and imports were equivalent to two-thirds of domestic consumption in 1983. Belgium continued to import all raw materials for the production of its steel, copper, lead, zinc, and other major metal commodities. Of total imports, almost 9% were in metals alone. The country's mineral industry depended heavily on the export of finished goods. Exports of metals in 1983 amounted to more than 11% of this total. The neighboring Federal Republic of Germany, France, Luxembourg, the Netherlands, the United Kingdom, and the United States were the main trading partners; most base-metal ores came from Africa. Salient preliminary trade statistics for 1983 in the minerals industry are shown in the following table, in million dollars:

Item	Export	Import
Metallic ores	86	918
Iron and steel	4,021	1,715
Nonferrous metals	1,459	1,574
Metals, total	5,786	4,522
Nonmetals	221	315
Mineral fuels	3,521	7,639
All goods	50,511	52,584
Europe	40,808	41,713
United States	2,613	3,296

Table 2.—Belgium-Luxembourg: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	[r]127	51	--	NA.
Alkaline-earth metals	1	25	--	NA.
Aluminum:				
Ore and concentrate	654	1,216	--	France 1,065; West Germany 92.
Oxides and hydroxides	660	470	--	United Kingdom 182; France 134.
Ash and residue containing aluminum	7,457	6,976	--	West Germany 5,589.
Metal including alloys:				
Scrap	38,469	40,444	13	France 17,102; West Germany 11,649.
Unwrought	29,666	13,754	--	West Germany 4,752; Netherlands 4,436; France 3,459.
Semimanufactures	228,810	243,129	14,516	France 50,856; West Germany 43,258; United Kingdom 34,324.
Antimony: Metal including alloys, all forms	264	1	--	NA.
Arsenic: Metal including alloys, all forms	10	7	--	United Kingdom 5; West Germany 1.
Cadmium: Metal including alloys, all forms	575	547	16	France 261; West Germany 213.
Chromium:				
Oxides and hydroxides	79	316	16	France 250; Italy 25.
Metal including alloys, all forms	399	281	67	West Germany 54; United Kingdom 51.
Columbium and tantalum: Ash and residue containing columbium and/or tantalum	2,721	140	--	NA.
Copper:				
Ore and concentrate	727	630	--	Netherlands 408; West Germany 113.
Oxides and hydroxides	1,059	1,189	NA	West Germany 412; France 244.
Sulfate	8,997	7,840	NA	Netherlands 2,584; West Germany 2,222.
Ash and residue containing copper	2,918	3,972	NA	West Germany 1,433; France 1,093.
Metal including alloys:				
Scrap	24,065	30,552	--	West Germany 12,830; Netherlands 6,620; France 4,435.
Unwrought	303,163	306,476	2,226	France 94,742; West Germany 91,609; United Kingdom 23,906.
Semimanufactures	244,364	258,986	1,464	West Germany 88,041; France 68,612; Netherlands 29,853.
Gold:				
Waste and sweepings value, thousands	$3,484	$3,908	--	Netherlands $2,216; United Kingdom $1,185.
Metal including alloys, unwrought and partly wrought thousand troy ounces	970	1,639	NA	Switzerland 995; West Germany 300; United Kingdom 165.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	18,693	401	--	Italy 289; Netherlands 101.
Pyrite, roasted	159,265	173,758	--	West Germany 158,672; France 8,685.
Metal:				
Scrap	578,431	497,556	--	West Germany 202,830; France 91,215; Netherlands 75,380.
Pig iron, cast iron, related materials	9,923	8,266	--	France 3,880; Netherlands 2,635.
Ferroalloys:				
Ferrochromium	3,858	1,960	NA	France 860; West Germany 757.
Ferromanganese	12,129	13,230	--	West Germany 6,600; France 4,002.
Ferromolybdenum	31,093	18,546	NA	NA.
Ferronickel	28	7	--	NA.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Ferroalloys —Continued				
Ferrosilicon	4,633	4,270	NA	France 2,082; West Germany 2,043.
Silicon metal	177	29	6	Japan 5; Canada 2.
Unspecified	3,434	2,854	800	West Germany 901; Czechoslovakia 473.
Steel, primary forms thousand tons	2,734	2,225	75	France 1,054; Italy 380; West Germany 304.
Semimanufactures:				
Bars, rods, angles, shapes, sections do.	3,524	3,011	338	West Germany 726; France 559.
Universals, plates, sheets do.	5,021	4,381	280	France 1,203; West Germany 920.
Hoop and strip do.	599	462	1	West Germany 182; France 130.
Rails and accessories do.	86	79	7	France 28; Italy 16.
Wire do.	462	287	24	West Germany 65; France 41.
Tubes, pipes, fittings do.	358	397	1	U.S.S.R. 85; France 62.
Lead:				
Oxides	3,332	4,663	2	West Germany 3,171; Netherlands 763; Iraq 166.
Ash and residue containing lead	5,360	6,641	NA	West Germany 3,533; France 2,865.
Metal including alloys:				
Scrap	13,417	13,811	--	France 9,570; Netherlands 2,246.
Unwrought	[r]70,578	74,647	1,207	West Germany 19,383; Netherlands 17,551.
Semimanufactures	8,486	9,978	19	Netherlands 4,502; West Germany 1,821; France 1,638.
Lithium: Oxides and hydroxides	54	67	NA	Egypt 36; France 20.
Magnesium: Metal including alloys:				
Scrap	171	119	33	West Germany 44; Netherlands 38.
Unwrought	--	66	16	Netherlands 43.
Semimanufactures	16	125	--	Italy 97; France 12.
Manganese:				
Ore and concentrate, metallurgical-grade	8,333	8,546	791	Netherlands 7,167; France 445.
Metal including alloys, all forms	132	266	NA	West Germany 78; United Kingdom 63.
Mercury 76-pound flasks	412	992	--	West Germany 435; Netherlands 203.
Molybdenum:				
Ore and concentrate	9,093	9,300	NA	France 2,345; United Kingdom 2,289; West Germany 1,788.
Oxides and hydroxides	154	53	--	United Kingdom 40.
Metal including alloys:				
Unwrought	24	6	--	All to West Germany.
Semimanufactures	157	56	--	Netherlands 41; France 13.
Nickel:				
Matte and speiss	--	17	NA	Switzerland 4.
Ash and residue containing nickel	7,957	7,825	NA	Canada 6,106.
Metal including alloys:				
Scrap	1,432	984	234	West Germany 229; India 229; Netherlands 137.
Unwrought	120	689	130	West Germany 352; Turkey 134.
Semimanufactures	352	590	--	West Germany 450; Netherlands 39.
Platinum-group metals:				
Waste and sweepings value, thousands	$5,078	$5,100	NA	West Germany $2,962; France $801; Netherlands $672.
Metals including alloys, unwrought and partly wrought troy ounces	250,936	209,046	148,377	France 7,459; United Kingdom 7,395.
Rhenium: Metal including alloys, all forms value	$43,279	$42,153	NA	NA.
Silver:				
Waste and sweepings value, thousands	$6,092	$4,796	NA	United Kingdom $3,558; West Germany $1,044.
Metal including alloys, unwrought and partly wrought thousand troy ounces	31,345	30,732	12,200	United Kingdom 9,479; France 3,110; Italy 1,888.
Tin:				
Ash and residue containing tin	2,291	1,985	NA	United Kingdom 1,731.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Tin —Continued				
Metal including alloys:				
Scrap	102	86	--	West Germany 52; Netherlands 32.
Unwrought	825	411	25	Netherlands 216; United Kingdom 42.
Semimanufactures	131	60	10	West Germany 25; Netherlands 8.
Titanium:				
Oxides	34,121	32,145	4,758	West Germany 9,985; Italy 1,881.
Metal including alloys:				
Scrap	22	21	7	NA.
Unwrought	5	10	5	NA.
Semimanufactures	76	82	NA	Italy 39; Spain 7; Portugal 5.
Tungsten:				
Ash and residue containing tungsten	34	25	--	NA.
Metal including alloys:				
Scrap	23	37	--	West Germany 31; Austria 6.
Unwrought	30	20	--	France 8; Italy 4.
Semimanufactures	90	70	(2)	Netherlands 51; West Germany 13.
Vanadium:				
Oxides and hydroxides	134	35	--	NA.
Ash and residue containing vanadium	4,775	1,884	--	NA.
Metal including alloys, all forms	32	186	--	West Germany 169.
Zinc:				
Ore and concentrate	41,367	18,409	--	France 18,387.
Oxides	5,547	4,031	--	France 865; West Germany 765.
Blue powder	15,547	16,372	NA	West Germany 8,360; Netherlands 2,093.
Matte	2,753	1,694	NA	France 882; West Germany 627.
Ash and residue containing zinc	27,583	45,907	NA	France 22,947; West Germany 20,217.
Metal including alloys:				
Scrap	11,500	12,471	--	Netherlands 7,258; France 3,284.
Unwrought	148,552	151,194	3,150	West Germany 55,413; France 28,908.
Semimanufactures	9,369	10,428	112	West Germany 7,432; Netherlands 1,176.
Zirconium:				
Ore and concentrate	16	83	--	NA.
Metal including alloys, all forms	2	15	--	Japan 8; France 7.
Other:				
Ores and concentrates	202	25	--	NA.
Oxides and hydroxides	8,966	6,687	214	Netherlands 4,859; West Germany 497.
Ashes and residues	20,561	10,340	194	Netherlands 5,628; West Germany 2,386.
Base metals including alloys, all forms	r354	313	15	Austria 90; West Germany 78.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	107	2,791	--	Netherlands 2,489; France 291.
Artificial:				
Corundum	693	1,051	(2)	Netherlands 350; France 324.
Silicon carbide	991	1,623	NA	France 841; Netherlands 451; West Germany 327.
Dust and powder of precious and semiprecious stones including diamond kilograms	689	812	68	Netherlands 128; Israel 125.
Grinding and polishing wheels and stones	2,489	2,402	5	France 1,468; West Germany 247.
Asbestos, crude	221	1,084	1	Portugal 610; Iraq 212; Greece 139.
Barite and witherite	19,278	13,098	--	Netherlands 10,190; United Kingdom 2,817.
Boron materials:				
Crude natural borates	18,347	15,180	873	Netherlands 8,238; West Germany 2,759.
Elemental	2	7	--	NA.
Oxides and acids	348	185	--	France 111; Burma 16.
Cement thousand tons	2,979	2,707	11	Netherlands 1,270; West Germany 425; France 373.
Chalk	77,230	86,273	31	France 21,061; West Germany 13,758; Netherlands 13,720.
Clays, crude:				
Andalusite, kyanite, sillimanite	964	179	--	NA.
Bentonite	--	4,804	--	West Germany 2,486; Netherlands 1,439.
Chamotte earth	2,195	2,451	--	West Germany 2,044.
Dinas earth	24	232	--	NA.
Kaolin	8,362	16,324	--	Netherlands 9,027; West Germany 2,711.
Unspecified	8,976	1,176	--	Netherlands 923.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Cryolite and chiolite	21	33	--	France 25; West Germany 4.
Diamond:				
Gem, not set or strung thousand carats	34,121	37,255	1,120	India 16,976; United Kingdom 13,033.
Industrial do.	10,700	9,027	1,242	United Kingdom 5,415; West Germany 495.
Diatomite and other infusorial earth	924	65,126	--	Netherlands 64,824.
Feldspar, fluorspar, related materials:				
Fluorspar	4,697	3,431	--	West Germany 3,228.
Unspecified	557	249	--	France 240.
Fertilizer materials:				
Crude, n.e.s	28,283	36,453	--	France 23,838; Netherlands 9,275.
Manufactured:				
Ammonia	53,382	23,485	--	France 20,439; Netherlands 2,282.
Nitrogenous thousand tons	1,907	2,401	35	France 702; West Germany 651; Netherlands 221.
Phosphatic do.	1,107	945	--	West Germany 608; France 192.
Potassic do.	595	30	--	Netherlands 17; West Germany 6.
Unspecified and mixed do.	1,609	1,737	5	France 885; West Germany 246.
Graphite, natural	298	31	--	Netherlands 26; France 2.
Gypsum and plaster	140,022	114,144	--	West Germany 57,013; Netherlands 55,266.
Iodine	112	155	NA	Spain 65; France 42; United Kingdom 35.
Lime	693,732	614,823	--	Netherlands 448,508; West Germany 100,896.
Magnesium compounds:				
Magnesite	r194	1,436	NA	West Germany 1,421.
Oxides and hydroxides	181	92	NA	NA.
Other	1,304	1,392	NA	Martinique 1,001; France 169.
Nitrates, crude	12,555	17,236	--	West Germany 6,306; Netherlands 5,457.
Phosphates, crude	14,779	10,379	--	France 7,365; West Germany 1,297.
Pigments, mineral:				
Natural, crude	120	224	NA	NA.
Iron oxides and hydroxides, processed	8,765	12,319	168	France 6,398; Italy 2,078.
Potassium salts, crude	1,484	391	--	Netherlands 369; West Germany 22.
Precious and semiprecious stones other than diamond:				
Natural kilograms	353	6,989	5,020	Hong Kong 636; France 159.
Synthetic do.	3,284	3,592	NA	Republic of Korea 1,631; France 792; Japan 569.
Pyrite, unroasted	193	1,223	--	West Germany 1,148; France 50.
Quartz crystal, piezoelectric kilograms	--	685	NA	NA.
Salt and brine	107,218	124,876	2	France 104,390; Netherlands 18,103.
Sodium compounds, n.e.s.: Carbonate, manufactured	11,862	17,009	--	France 14,554; Netherlands 1,487.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	593	418	(2)	Netherlands 394; West Germany 18.
Worked do.	20	20	(2)	West Germany 7; Netherlands 7.
Dolomite, chiefly refractory-grade do.	1,239	1,129	1	Netherlands 485; West Germany 380; France 238.
Gravel and crushed rock do.	8,534	8,160	(2)	Netherlands 4,228; France 3,562.
Limestone other than dimension do.	550	507	--	Netherlands 272; France 232.
Quartz and quartzite do.	13	12	(2)	West Germany 7; France 2.
Sand other than metal-bearing do.	2,984	2,933	(2)	France 1,082; Netherlands 840.
Sulfur:				
Elemental:				
Crude including native and byproduct	9,128	7,135	--	West Germany 2,706; France 1,892.
Colloidal, precipitated, sublimed	87	117	3	France 43; Venezuela 28.
Sulfuric acid	122,169	86,668	--	France 48,630; Venezuela 5,366.
Talc, steatite, soapstone, pyrophyllite	28,267	24,183	3	West Germany 4,908; Sweden 4,500; United Kingdom 3,082.
Other:				
Crude	783,489	986,730	18	Netherlands 952,087; France 25,697.
Slag and dross, not metal-bearing thousand tons	1,974	2,180	--	France 804; Netherlands 659; West Germany 654.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	5,698	62,341	--	France 59,967; Netherlands 2,213.
Carbon: Carbon black	653	748	--	France 284; West Germany 232.
Coal:				
Anthracite	72,493	71,561	--	France 36,784; United Kingdom 19,216.
Bituminous	820,440	676,746	--	West Germany 469,684; Netherlands 57,034.
Briquets of anthracite and bituminous coal	16,231	12,517	--	France 11,944; Switzerland 532.
Lignite including briquets	31	1,997	--	Netherlands 1,466; United Kingdom 433.
Coke and semicoke	892,646	481,927	--	France 209,530; Romania 109,281.
Gas, natural million cubic feet	665	561	NA	France 557.
Peat including briquets and litter	2,476	5,202	--	France 3,350; Netherlands 1,821.
Petroleum:				
Crude thousand 42-gallon barrels	427	1,325	--	West Germany 1,280; United Kingdom 45.
Refinery products:				
Liquefied petroleum gas do.	3,328	3,394	11	Netherlands 2,158; France 408.
Gasoline do.	33,533	26,813	753	West Germany 6,934; Netherlands 4,845; Switzerland 4,724.
Mineral jelly and wax do.	40	57	5	France 15; West Germany 8.
Kerosine and jet fuel do.	12,132	13,042	7	West Germany 4,036; United Kingdom 1,947; Netherlands 1,760.
Distillate fuel oil do.	26,185	27,488	([2])	West Germany 14,605; Netherlands 3,281; France 3,240.
Lubricants do.	2,652	2,543	1	Netherlands 665; West Germany 206.
Residual fuel oil do.	43,078	40,890	5,070	United Kingdom 10,383; Netherlands 5,618.
Bitumen and other residues do.	1,684	998	--	United Kingdom 400; Netherlands 315.
Bituminous mixtures do.	88	88	--	Netherlands 34; France 24.
Petroleum coke do.	10	227	--	Austria 163; West Germany 40.

[r] Revised. NA Not available.

[1] Table prepared by Jozef Plachy.

[2] Less than 1/2 unit.

Table 3.—Belgium-Luxembourg: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	46	28	10	West Germany 10.
Alkaline-earth metals	--	77	--	All from France.
Aluminum:				
Ore and concentrate	33,050	26,574	--	West Germany 13,926; Guyana 5,712.
Oxides and hydroxides	23,635	22,887	1,081	West Germany 17,355; Netherlands 2,031.
Ash and residue containing aluminum	682	762	--	NA.
Metal including alloys:				
Scrap	39,095	51,239	3,761	Netherlands 15,787; France 14,580; West Germany 10,032.
Unwrought	244,955	267,444	([2])	Netherlands 137,639; France 29,592; Norway 25,963.
Semimanufactures	83,911	86,927	801	West Germany 33,807; France 21,162; Netherlands 17,945.
Antimony:				
Ore and concentrate	--	3,962	NA	Bolivia 2,432; Thailand 665.
Metal including alloys, all forms	NA	198	--	China 177.
Arsenic:				
Oxides and acids	32	80	NA	NA.
Metal including alloys, all forms	90	86	--	Sweden 83.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Cadmium: Metal including alloys, all forms	1,131	1,199	NA	West Germany 297; France 231; Zaire 213.
Cesium and rubidium: Metal including alloys, all forms	11	1	--	NA.
Chromium:				
Ore and concentrate	1,832	2,108	--	Netherlands 1,909; West Germany 124.
Oxides and hydroxides	822	863	(2)	West Germany 415; Italy 330.
Metal including alloys, all forms	219	298	NA	West Germany 78; United Kingdom 67; Japan 46.
Cobalt: Oxides and hydroxides	74	62	--	United Kingdom 47; France 8.
Columbium and tantalum:				
Ore and concentrate	2,679	1,685	NA	Canada 1,654.
Ash and residue containing columbium and/or tantalum	807	371	--	All from West Germany.
Copper:				
Ore and concentrate	17,417	15,960	--	Canada 9,954; Chile 4,149.
Oxides and hydroxides	125	207	NA	Netherlands 108; West Germany 60.
Sulfate	1,032	1,089	NA	Netherlands 468; Hungary 242.
Ash and residue containing copper	45,932	45,409	10,502	Sweden 8,446; France 8,111.
Metal including alloys:				
Scrap	104,715	113,628	6,823	France 31,061; United Kingdom 19,380; Netherlands 18,893.
Unwrought	483,819	473,709	1,253	Zaire 281,982; Chile 31,005.
Semimanufactures	40,035	41,021	162	West Germany 23,833; France 7,966.
Gold:				
Waste and sweepings value, thousands	$2,480	$1,981	NA	France $630; Netherlands $477; Switzerland $385.
Metal including alloys unwrought and partly wrought thousand troy ounces	16,983	9,092	5,967	West Germany 1,333; Switzerland 639.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	21,148	18,613	25	France 5,083; Brazil 3,583; Sweden 2,581.
Pyrite, roasted	95,687	60,066	--	West Germany 53,541; Norway 6,264.
Metal:				
Scrap	955,710	887,417	15,359	West Germany 368,561; Netherlands 289,698; France 159,222.
Pig iron, cast iron, related materials	97,653	98,058	64	France 52,287; West Germany 28,367.
Ferroalloys:				
Ferrochromium	25,474	26,231	--	West Germany 4,285; Albania 4,196.
Ferromanganese	91,262	54,012	--	France 23,454; Norway 22,780.
Ferromolybdenum	446	254	--	Netherlands 86; West Germany 73.
Ferronickel	3,226	3,316	--	France 1,522; Indonesia 767.
Ferrosilicochromium	1,527	1,229	--	West Germany 979; France 120.
Ferrosilicomanganese	19,956	19,609	--	Norway 14,647; Sweden 615.
Ferrosilicon	38,202	33,831	--	West Germany 13,112; Norway 10,667.
Silicon metal	642	326	--	France 284.
Unspecified	3,288	2,400	--	Spain 803; West Germany 596.
Steel, primary forms	888,548	803,853	4,184	Netherlands 228,554; West Germany 162,957; France 155,751.
Semimanufactures:				
Bars, rods, angles, shapes, sections	838,672	875,386	235	France 283,321; West Germany 189,167; Netherlands 127,301.
Universals, plates, sheets	625,351	618,749	641	Netherlands 203,447; West Germany 138,297; France 137,012.
Hoop and strip	114,131	119,869	47	West Germany 57,169; France 48,241.
Rails and accessories	25,508	12,582	14	France 10,245; West Germany 884.
Wire	56,074	60,053	83	West Germany 41,059; France 8,624.
Tubes, pipes, fittings	218,423	271,929	976	West Germany 77,777; France 61,691; Netherlands 55,173.
Castings and forgings, rough	73,353	60,398	1,131	France 20,892; West Germany 18,273; Netherlands 17,087.
Lead:				
Ore and concentrate	83,142	106,078	--	Peru 56,737; Canada 23,326.
Oxides	1,690	1,857	(2)	France 1,049; West Germany 710.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Lead —Continued				
Ash and residue containing lead	61,288	65,782	17,967	France 12,254; Italy 4,669.
Metal including alloys:				
Scrap	7,520	11,238	119	Netherlands 5,753; Ireland 1,955.
Unwrought	41,234	43,890	2,581	France 16,286; United Kingdom 7,152.
Semimanufactures	2,424	1,478	4	West Germany 1,016; Netherlands 236.
Lithium:				
Oxides and hydroxides	133	209	--	West Germany 176; China 20.
Metal including alloys, all forms	7	16	--	Netherlands 10; France 6.
Magnesium: Metal including alloys:				
Scrap	96	183	6	Netherlands 153; Nigeria 17.
Unwrought	1,633	1,838	10	Italy 656; Norway 379.
Semimanufactures	310	308	127	West Germany 63; France 47.
Manganese:				
Ore and concentrate, metallurgical-grade	244,784	227,058	4	Republic of South Africa 101,424; Congo 45,512; Australia 32,688.
Oxides	5,110	7,773	1	Greece 4,997; Ireland 1,854.
Metal including alloys, all forms	710	1,467	160	Netherlands 466; France 400.
Mercury 76-pound flasks	5,185	8,296	29	Spain 3,202; Netherlands 2,538.
Molybdenum:				
Ore and concentrate	20,772	20,469	NA	Netherlands 5,615; Canada 5,375.
Oxides and hydroxides	120	192	33	Netherlands 129.
Metal including alloys:				
Unwrought	27	28	--	West Germany 16.
Semimanufactures	90	114	NA	Netherlands 96; Austria 5.
Nickel:				
Ore and concentrate	25	25	--	All from West Germany.
Matte and speiss	446	338	--	Cuba 182; Netherlands 107.
Oxides and hydroxides	106	88	--	Netherlands 34; France 22.
Ash and residue containing nickel	296	1,269	145	France 344; West Germany 298.
Metal including alloys:				
Scrap	983	499	--	Austria 177; Netherlands 128.
Unwrought	2,450	4,117	928	Netherlands 1,037; West Germany 807.
Semimanufactures	1,246	1,572	49	West Germany 1,000; United Kingdom 206.
Platinum-group metals:				
Waste and sweepings value, thousands	$4,597	$6,321	NA	Netherlands $5,991.
Metals including alloys, unwrought and partly wrought troy ounces	91,524	91,534	NA	United Kingdom 43,211; West Germany 23,567.
Selenium, elemental	19	68	2	United Kingdom 54; Japan 10.
Silver:				
Ore and concentrate[3] value, thousands	$32,075	$12,080	$6,873	Peru $5,206.
Waste and sweepings do	$16,454	$14,689	$11,614	West Germany $421.
Metal including alloys, unwrought and partly wrought thousand troy ounces	39,674	42,773	19,337	Netherlands 13,297; West Germany 476.
Tin:				
Ore and concentrate	126	151	--	All from Chile.
Ash and residue containing tin	645	220	NA	Netherlands 119; West Germany 67.
Metal including alloys:				
Scrap	187	62	(2)	Netherlands 43; France 12.
Unwrought	2,744	2,396	--	Netherlands 1,095; Malaysia 335.
Semimanufactures	283	273	5	Netherlands 144; West Germany 57.
Titanium:				
Ore and concentrate	119,944	71,301	NA	Canada 59,505; Republic of South Africa 10,718.
Oxides	6,480	8,417	2,000	West Germany 4,330; France 1,534.
Metal including alloys:				
Scrap	461	685	523	United Kingdom 113.
Unwrought	81	173	43	China 103; United Kingdom 20.
Semimanufactures	372	157	1	West Germany 74; France 13.
Tungsten: Metal including alloys:				
Scrap	19	45	NA	France 13; West Germany 13.
Unwrought	64	25	NA	West Germany 13; Austria 8.
Semimanufactures	93	85	NA	Netherlands 82.
Uranium and/or thorium: Ore and concentrate value, thousands	$2,550	$19	--	All from United Kingdom.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Vanadium:				
Ore and concentrate	351	5,026	NA	Mozambique 3,299; Netherlands 1,727.
Oxides and hydroxides	1,542	2,964	615	China 930; Republic of South Africa 679; West Germany 332.
Ash and residue containing vanadium	9,350	6,905	--	Mozambique 3,448; Netherlands 3,134.
Metal including alloys:				
Scrap	--	8	--	NA.
Unwrought	64	61	--	All from Republic of South Africa.
Zinc:				
Ore and concentrate	420,328	422,736	--	Canada 191,468; Peru 44,132.
Oxides	7,330	6,632	92	France 1,967; Netherlands 1,862.
Blue powder	494	329	NA	France 169; West Germany 82.
Matte	3,414	3,916	NA	West Germany 2,323; Netherlands 654.
Ash and residue containing zinc	74,989	61,388	7,202	West Germany 32,557; France 7,229.
Metal including alloys:				
Scrap	6,756	7,150	23	Netherlands 3,685; France 1,392.
Unwrought	45,598	42,605	(2)	Netherlands 22,792; France 9,346.
Semimanufactures	20,216	19,388	(2)	France 17,735; West Germany 1,131.
Zirconium:				
Ore and concentrate	4,793	6,039	NA	Netherlands 4,272; Republic of South Africa 601.
Metal including alloys:				
Scrap	39	20	--	France 12.
Semimanufactures	126	148	NA	France 113.
Other:				
Ores and concentrates	58,182	110,093	NA	Norway 99,149; Spain 10,678.
Oxides and hydroxides	711	1,113	6	West Germany 453; France 183.
Ashes and residues	^{r}15,124	23,154	10,916	West Germany 342; Canada 164.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	10,968	15,153	55	West Germany 14,373; Netherlands 450.
Artificial:				
Corundum	6,372	6,103	8	West Germany 2,276; France 1,682; Austria 1,295.
Silicon carbide	3,175	3,816	NA	West Germany 1,294; Spain 792; Italy 771.
Dust and powder of precious and semiprecious stones including diamond kilograms	2,950	2,302	1,322	Switzerland 625.
Grinding and polishing wheels and stones	2,971	3,211	88	West Germany 951; Italy 646; Austria 638.
Asbestos, crude	31,373	27,745	148	Canada 14,188; Hungary 4,859.
Barite and witherite	8,004	8,427	--	West Germany 6,124; France 1,814.
Boron materials:				
Crude natural borates	76,321	82,794	--	Netherlands 49,163; Turkey 33,445.
Oxides and acids	1,857	1,738	--	France 1,240; Turkey 347.
Bromine	660	794	NA	Israel 557; United Kingdom 91.
Cement	215,253	195,292	27	West Germany 101,142; Netherlands 84,048.
Chalk	119,025	137,110	--	France 110,095; Netherlands 6,310.
Clays, crude:				
Andalusite, kyanite, sillimanite	881	3,792	NA	West Germany 2,594; Netherlands 814.
Bentonite	25,798	21,336	NA	Italy 11,528; West Germany 4,090.
Chamotte earth	77,653	67,594	3,700	West Germany 42,469; France 16,961.
Dinas earth	796	1,556	NA	NA.
Kaolin	237,297	267,577	NA	Netherlands 96,402; United Kingdom 94,271.
Unspecified	108,260	235,156	4,310	West Germany 202,025; Netherlands 14,842.
Cryolite and chiolite	70	46	2	Denmark 44.
Diamond:				
Gem, not set or strung thousand carats	31,566	31,721	1,092	United Kingdom 19,170; Congo 2,291.
Industrial do	13,403	18,313	1,853	Zaire 4,541; Congo 3,230; United Kingdom 2,883.
Diatomite and other infusorial earth	8,368	6,535	616	France 4,229; Denmark 1,215.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Feldspar, fluorspar, related materials:				
Feldspar	28,294	21,355	--	France 19,404.
Fluorspar	12,128	11,988	--	Netherlands 4,108; West Germany 2,113.
Unspecified	29,561	33,540	--	Norway 28,973.
Fertilizer materials:				
Crude, n.e.s	67,434	77,121	--	Netherlands 67,669; France 4,826.
Manufactured:				
Ammonia	1,609	2,786	--	Netherlands 2,162; West Germany 612.
Nitrogenous	566,283	507,370	67,114	Netherlands 152,942; West Germany 128,146; France 77,886.
Phosphatic	97,428	151,029	71,191	Tunisia 32,568; Netherlands 29,319.
Potassic	990,894	915,448	8,643	West Germany 475,008; U.S.S.R. 206,822; East Germany 112,826.
Unspecified and mixed	291,894	468,808	153,617	West Germany 115,625; France 104,300; Netherlands 50,600.
Graphite, natural	6,493	811	--	West Germany 685; Japan 31.
Gypsum and plaster	376,454	371,184	100	France 316,531; West Germany 30,928.
Iodine	96	134	NA	Japan 130.
Lime	85,373	92,899	7	France 66,469; West Germany 24,900.
Magnesium compounds:				
Magnesite	r3,822	4,396	NA	Greece 1,164; Austria 596.
Oxides and hydroxides	5,304	4,860	74	Italy 2,776; United Kingdom 1,481.
Other	7,703	8,268	NA	Austria 2,645; Netherlands 1,480.
Mica:				
Crude including splittings and waste	1,612	1,803	17	France 633; India 409; Madagascar 250.
Worked including agglomerated splittings	117	66	(2)	Switzerland 39; West Germany 21; Spain 4.
Nitrates, crude	22,775	25,861	--	Chile 25,740; Netherlands 95.
Phosphates, crude thousand tons	2,252	2,089	266	Morocco 1,356; U.S.S.R. 175; Togo 168.
Phosphorus, elemental	234	280	--	Republic of South Africa 77; United Kingdom 63; Netherlands 59.
Pigments, mineral:				
Natural, crude	359	384	NA	NA.
Iron oxides and hydroxides, processed	6,320	5,958	290	West Germany 4,695; France 486.
Potassium salts, crude	67,434	28,137	--	West Germany 18,119; France 10,018.
Precious and semiprecious stones other than diamond:				
Natural kilograms	5,664	18,789	118	Hong Kong 1,200; Thailand 1,112; France 600.
Synthetic do	530	534	334	West Germany 7; Austria 5.
Pyrite, unroasted	207,879	235,540	--	Spain 182,192; Norway 40,715.
Quartz crystal, piezoelectric kilograms	58	5	NA	NA.
Salt and brine thousand tons	1,169	1,073	(2)	Netherlands 676; West Germany 364.
Sodium compounds, n.e.s.: Carbonate, manufactured	42,624	70,318	1	West Germany 25,231; France 19,055; Netherlands 12,489.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	98	101	--	France 44; West Germany 28.
Worked do	92	97	(2)	Netherlands 24; France 23; Italy 22.
Dolomite, chiefly refractory-grade do	42	42	--	West Germany 18; France 16.
Gravel and crushed rock do	7,396	6,018	(2)	Netherlands 3,108; United Kingdom 1,624; West Germany 664.
Limestone other than dimension do	264	308	--	United Kingdom 228; France 55.
Quartz and quartzite do	87	89	(2)	West Germany 71; France 8.
Sand other than metal-bearing do	10,857	9,254	3	Netherlands 7,616; West Germany 1,217.
Sulfur:				
Elemental:				
Crude including native and byproduct	444,699	358,718	164,399	Poland 60,239; Netherlands 36,411; Canada 34,780.
Colloidal, precipitated, sublimed	1,936	1,071	1	West Germany 725; France 343.
Dioxide	6,502	5,042	NA	West Germany 3,852.
Sulfuric acid	527,119	494,347	--	West Germany 244,524; France 104,133; Netherlands 99,378.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Talc, steatite, soapstone, pyrophyllite	45,491	58,751	17,072	France 12,465; Canada 9,480; Australia 8,360.
Other:				
Crude thousand tons	623	1,017	1	France 500; West Germany 190; Spain 160.
Slag and dross, not metal-bearing do	1,399	1,311	--	France 806; Netherlands 330; West Germany 130.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	69,981	64,547	381	France 63,191; West Germany 500.
Carbon: Carbon black	37,258	39,214	538	West Germany 13,018; Netherlands 12,331; France 10,448.
Coal:				
Anthracite thousand tons	1,706	1,527	42	West Germany 873; Republic of South Africa 266.
Bituminous do	8,708	9,398	4,423	Republic of South Africa 2,967; West Germany 663.
Briquets of anthracite and bituminous coal do	93	91	--	West Germany 79; France 10.
Lignite including briquets do	214	213	--	West Germany 193; East Germany 17.
Coke and semicoke do	3,029	2,263	181	West Germany 1,659; Netherlands 298.
Gas, manufactured million cubic feet	196	223	--	All from France.
Gas, natural do	346,061	307,504	--	Netherlands 223,443.
Peat including briquets and litter	140,274	136,923	--	Netherlands 85,839; West Germany 34,335.
Petroleum:				
Crude thousand 42-gallon barrels	198,781	173,032	--	Saudi Arabia 73,585; Libya 22,000; U.S.S.R. 15,264.
Refinery products:				
Liquefied petroleum gas do	5,152	5,484	55	Netherlands 2,150; United Kingdom 1,264.
Gasoline do	15,438	19,867	12	Netherlands 10,076; United Kingdom 2,202.
Mineral jelly and wax do	145	169	3	West Germany 82; Hungary 17.
Kerosine and jet fuel do	951	1,604	10	Netherlands 1,226; Italy 144.
Distillate fuel oil do	24,877	28,963	16	Netherlands 17,510; U.S.S.R. 6,572.
Lubricants do	4,196	3,880	204	Netherlands 1,203; France 1,102.
Residual fuel oil do	31,505	40,932	667	Netherlands 16,657; U.S.S.R. 10,217.
Bitumen and other residues do	323	376	(2)	France 184; Netherlands 151.
Bituminous mixtures do	115	92	4	France 40; Netherlands 26.
Petroleum coke do	938	2,003	1,415	Netherlands Antilles 352; Netherlands 98.

[r] Revised. NA Not available.

[1] Table prepared by Jozef Plachy.

[2] Less than 1/2 unit.

[3] May include other precious metals.

COMMODITY REVIEW

Metals.—*Aluminum.*—Primary aluminum was the only nonferrous metal commodity that registered a production increase during the year, although it is never a significant contributor to the country's GNP. Over 51% of Belgium's aluminum requirements are met through imports, mostly from the Netherlands.

Sidal NV, the only Belgian aluminum semimanufacturing company, received financial aid from the Flemish regional government, which thus became a 26.7% owner of the company; the Hoogovens Group BV of the Netherlands owned the rest. In addition to the injection of new capital for the administration of the company, major investments were to be made in a new inverse extrusion press, allowing Sidal to maintain and strengthen its position in the alloys market. In total, the aid package was to exceed $22 million.

Copper.—Belgium was a significant producer of refined copper, contributing about 6% of the world total. Two companies dominated the market, Métallurgie Hoboken-Overpelt SA (MHO), with a smelter at Antwerp-Hoboken (33% of domestic capacity) and a refinery at Olen (89% of domestic capacity), and La Metallo-Chimique SA with a smelter (67% of domestic capacity) and a refinery (11% of domestic capacity) both at Beerse. All copper ore and concentrate were imported, mostly from Canada and Chile; Zaire supplied close to 60% of unwrought copper for Belgian refineries.

During the year, MHO proceeded with plans to replace much of its copper anode casting equipment at the Olen works with a new process the company itself had developed over the past 4 years. Called Contilanod, the process allows the continuous casting of full thickness anodes that can be used in any conventional tankhouse. The new plant would account for over 30% of Olen's anode output by the middle of 1984.

In 1983, MHO celebrated its 75th anniversary. Since 1908, the company has grown into one of the world's major producers of special and minor nonferrous metals.

Germanium.—MHO's plant at Olen was the only producer of germanium in Belgium, and has become the biggest world supplier, with an annual capacity of 50 tons. The company operated a new high performance extraction unit of its own design, which enabled germanium to be extracted from various low-content substances. MHO began production of germanium in 1953, mainly as a byproduct from zinc electrolysis and from certain mixed lead and copper sulfide minerals. First used as a semiconductor element, it is now mainly used in infrared optics but is seen as a widespread future substitute for silicon in such elements.

Iron and Steel.—Steel production in Belgium was dominated by the giant Cockerill-Sambre SA (CS), which contributed 75% of domestic output, with plants at Charleroi and Liège. Other plants included the Boel Steel at La Vouviere, Clabecq Steel at Clabecq, and Sidérurgie Maritime (Sidmar) at Ghent. In 1983, CS ranked third among the world's top 26 steel companies, producing 4.7 million tons of crude steel.

Production in 1983 again rose, despite the worldwide steel crisis and domestic reorganization problems. Belgium produced almost 2% of the world's steel output, and ranked fifth among the EEC producers.

The EEC cut an additional 1.4 million tons annually from CS's permitted production capacity on top of the 1.7 million tons already undertaken or committed. By 1985, CS's capacity is to drop to 5.3 million tons, from 7.0 million tons in 1982 and 11.7 million tons in 1980. The Belgian industry had lost 16,900 jobs since 1982, and another 8,000 were projected by 1985.

Revenue from steel in 1983 amounted to over $110 million, which represented about 0.14% of the GNP; of that, over $84 million came from exports, or 76% of total steel sales.

Most of the steel in Belgium, almost 93%, was produced by the oxygen process, as shown in the following table, in thousand metric tons:

Year	Oxygen	Electric	Open hearth	Other	Total
1981	11,512	756	--	18	12,286
1982	9,168	714	--	18	9,900
1983^e	9,442	695	--	18	10,155
World total (1982)	315,258	133,746	126,128	1,147	576,279

^{e}Estimated.

As for the past several years, steel restructuring talks continued in 1983, revolving mostly around CS's production capacity and employment reductions. The unemployment rate in the regions of Charleroi and Liège, traditional Walloon centers of steelmaking and metal-forming industries, was over 15% and was still rising. The continued state subsidies to CS were ineffective, and the region was in economic difficulties. In addition, over $107 million was promised by the EEC to the Belgian Government to ease the crisis. CS lost almost $172 million, down from $207 million in 1982. The bankruptcy that has loomed over the company for the past several years, and an earthquake that hit the Liège area in November 1983, did not make it an easy year for CS. The future of the state-owned company remained uncertain, at least until the Belgian Government concludes negotiations with Luxembourg and the Netherlands on joint measures aimed at complementary production.

Lead and Zinc.—Belgium was a significant producer of lead and zinc metal. Lead was produced by only one company, MHO. and zinc was produced by MHO and Vieille-Montagne SA. In 1982, the last year for which numbers are available, over 53% of lead ore and concentrate was imported from Peru; over 45% of zinc was imported from Canada, with 10% each imported from Peru and France. Almost 60% of all available smelted lead metal and over 53% of zinc metal was exported. The Federal Republic of Germany received the bulk of lead and zinc.

Nonmetals.—Construction materials and a few nonmetallic minerals were still being mined in Belgium in 1983. In contrast to processed metals, production of many of them increased, such as that of the unique petit granite and dolomite. Lime also registered an increase and accounted for 2.4% of total world output.

Dolomite.—Belgium was one of the leading producers of dolomite in Europe, with at least seven companies supplying crude and some dead-burned dolomite. The main areas of production were centered around Marcheles-James in the center of the Sambre-Meuse Valley. SA des Dolomies de Marcheles-Dames was the main producer of calcined and sintered material. The annual capacity of the quarry was 2.5 million tons, from which 200,000 tons of high-purity, high-density dead-burned dolomite and 200,000 tons of dolomitic lime were produced.

Fertilizer Materials.—Except for nitrogen in ammonia and phosphates (Thomas slag), Belgium did not produce much fertilizer materials. The port of Antwerp, however, was the most important distribution center for fertilizers in northwestern Europe. Of the total tonnage of 80 million tons handled annually, over 4 million tons were fertilizers and fertilizer raw materials, including sulfur.[3] The most important product passing through Antwerp for export was potash, about 500,000 tons were handled; potash from the Federal Republic of Germany constituted the largest portion. Some of this was destined for BASF AG's compound fertilizer plant at Antwerp, which had a capacity to produce 750,000 tons annually of various grades of nitrogen, phosphorus, and potash. The BASF Antwerp site also produced phosphoric acid, sulfuric acid, and ammonium sulfate. Some of the potash from the Federal Republic of Germany went into the manufacture of potassium sulfate in Belgium's three plants and was then reexported. About 300,000 tons of potassium sulfate was exported through the port. French potassium chloride was also used in the manufacture of potassium sulfate in Belgium.

In addition to exporting potash, Antwerp was also an important distribution point for compound fertilizers produced in northwestern Europe. At one time, about 1 million tons of mixed fertilizers passed through the port for export, although the level at the time of this report was lower because exports from Western European countries have declined. Compound fertilizers passing through Antwerp included those from plants in Belgium and from neighboring Western European countries.

In contrast to the decline in compound fertilizer trade, shipments of nitrogenous fertilizers have tended to be on the increase and recent levels were about 1 million tons. Transit traffic consisted of products that came from the Federal Republic of Germany and the Netherlands.

Phosphate fertilizers made up a small quantity of fertilizers passing through Antwerp, and included basic slag from the Belgian and Luxembourg blast furnaces, which have fallen considerably because less use was made of phosphatic ores in the steel industry. Other phosphate fertilizers have not amounted to very large tonnages either because Western Europe was itself a large importer and consumer of phosphate fertilizers.

Sand (Silica).—The Belgian company, Sablieres & Carriéres et Compagnie Belge des Silices Reunies SA (SCR-Sibelco), was the largest of three silica sand producers in Western Europe.[4] The other two were a West German and a British company. SCR-Sibelco controlled seven subsidiaries and three associated companies. Belgium was the major exporter of silica sand in Western Europe with exports being about five times greater than imports in 1982. Total exports have, however, fallen by about 12% in successive years, while imports have been somewhat erratic, as shown in the following table, in metric tons:

	1980	1981	1982
Export	2,814,339	2,481,208	2,152,218
Import	822,364	996,297	416,790

In 1982, over 80% of the exports were to member countries of the EEC, with France, and the Netherlands being the largest importers, followed by Italy and the Federal Repubic of Germany. The imports were mostly from the Netherlands.

Silica sand deposits of Cenozoic age are indigenous to most of the countries in Western Europe but high-quality material is more restricted, being concentrated in Belgium, France, the Netherlands, and the Federal Republic of Germany. In Belgium, silica sand deposits were worked at two principal localities, the area around Mol about 35 miles east of Antwerp, and the upland area by the River Meuse in Maasmechelen about 60 miles east of Antwerp. Sands from the Mol area have a low iron content, an average 0.025% iron oxide (Fe_2O_3), which made them ideally suited for the manufacture of all types of glass except crystal. Sands for the foundry and ceramic industries were also produced in 1983. Sand from the Massmechelen area is exceptionally pure, with the iron content as low as 0.012% Fe_2O_3, a low alumina content, and little contamination from heavy minerals. These sands were suitable for the manufacture of crystal glass and silicon carbide. Sand from the two main areas of production, Mol and Massmechelen, was mined mainly for export to neighboring countries, which produced poorer quality material.

Mineral Fuels.—There were essentially no changes in the energy resources sector in Belgium in 1983. Belgium is an energy poor country. It has some coal, mining of which was subsidized by the Government because seams are deep and generally commercially unavailable. The country imported all of its oil and most of its gas. The Government in 1983 emphasized, therefore, the development of nuclear power, which supplied over 25% of its electricity. In order to ease its 90% energy dependence on imports, the Parliament attempted to come up with an energy policy that emphasized the rational use and conservation of coal, provision of continued subsidies for the coal mines, planning of new electric-generation capacity, and the handling of nuclear materials. For example, the 1983 budget contained substantial funds for subsidies in energy conservation. In addition, the Government projected a continuing decline in the reliance on oil through the substitution of gas and electricity, and through the increased share of nuclear power in electricity generation.

Coal.—Coal, Belgium's only domestic energy resource, was a significant element in the country's socioeconomic activity. A small amount of subsidized mined coal was, as previously, exported, yet Belgian utility industries were heavily dependent on coal imports. The mines have now received Government subsidies for a long time, and recently these subsidies have been considered as purchases of ownership. The Government now owns over a 70% interest in the largest coal producer, NV Kempense Steenkolenmijnen, in northern Limbourg Province. In 1982, coal subsidies amounted to over $156 million.

In the last several years, coal accounted for over 30% of all electricity production, which used 6.5 million tons of coal for its generation.

Natural Gas.—Belgium produced a small quantity of natural gas; most of the gas was manufactured. In 1980, the Government purchased a 50% interest in Distrigaz SA, the only firm that imports natural gas, 80% of it from the Netherlands, and the rest from Norway and Algeria.

In 1983, the Belgian Government announced the discovery of natural gas during exploration for thermal spring sources. Gas with 40% methane was detected at a depth of almost 6,000 feet at Merkplas near the Netherlands border. The drilling was then stopped and the Belgian Geological Survey was to enter into a contract with a private firm to determine the volume and quality of the gas and whether it could be used commercially.

Nuclear Power.—In the 1970's, Belgium's most important energy policy development was perhaps the decision to make nuclear power the base of its electricity system. In 1983, more than 25% of total electricity was generated from nuclear power. There were six operational nuclear power stations, with two others planned for the next 2 years. The total capacity was 15,669,000 megawatts.

Petroleum.—Belgium had no domestic production, but the country has long been an important processing center for imported petroleum. Only about one-half of the output from the refineries was consumed domestically, the balance being exported primarily to the Netherlands. The petroleum industry was the only energy producer that was entirely privately owned.

LUXEMBOURG

In the 10 years since the collapse of its steel industry, the Grand Duchy of Luxembourg has begun to rely on banking as its economic sustainer. Steel, nevertheless, remained the only heavy and most significant industry in 1983, influencing almost all aspects of life in Luxembourg. On the average, each citizen produced more steel than the citizen of any other country in the world, although Luxembourg is no bigger than the State of Maryland, United States. Furthermore, all of it was produced by one company.

The prevailing recession was mainly attributed to the slump in world steel demand; the result in Luxembourg was declines in output of 6.7% in 1980, 17.9% in 1981, 7.4% in 1982, and 6% in 1983 when only 3.3 million tons of crude steel was produced, almost the same amount as in 1958. Declines in production of all mineral commodities were in-line with the overall economic decline of the country. Other industries have withstood the recession better than steel, but production still fell back by about 3%.

Employment in the industrial sector continued to fall, as it has since 1974. The metals production industry in 1983 employed about 69,000 workers, and metals processing employed 108,500 workers, a high 48% of the total population. The energy sector employed 85,900 workers, or 23% of the total population.

Despite a fall in the steel industry work force, there was a slight rise in the overall number of wage and salary earners, but insufficient to keep the unemployment rate from reaching about 5%, compared with 4.7% in 1982, 4.3% in 1981, and only 0.7% in 1980. Although this remained low by international standards, there was no unemployment before 1975.

Metals.—*Aluminum.*—Luxembourg Aluminum SA's (Luxalum) new 15,000-ton-per-year foil plant in Dudelange entered into its final construction phase and was scheduled to come on-stream in January 1984, as planned. Two continuous casters were already installed and started up in November 1983. The plant is to produce aluminum foil ranging from 0.8 to 0.005 millimeter gauge, in widths up to 1,625 millimeters, for use mainly by the packaging industry. Other uses will be in the insulation foil market, cable wrap, transfer foil, heat exchange, and pipe jacketing. About $40 million was already invested in the plant, which included two continuous casters. Luxalum is a subsidiary of National Aluminum Inc. of Pittsburgh, Pennsylvania, United States.

Steel.—Because all iron ore mining had ceased in November 1981, 6,160 million tons of ore was imported in 1982, 77% from French mines close to the border in the south. The last year Luxembourg exported iron ore was in 1977, 35,872 tons. Acieries Réunies de Burbach-Eich-Dudelange SA (ARBED) was the sole privately owned iron and steel producer in the country in 1983. It was the fourth largest steel company in Europe and ninth largest in the world.

Pig iron was produced at a lowered output in ARBED's three to five blast furnaces; the rest of the total of nine were idle.

Although the past 2 years were tumultuous for Luxembourg's steel industry, the decline in production was moderate. Steel was produced, only by the oxygen process, in four plants situated near the Belgian and French borders in the south.

All coke, about 1.7 million tons, used in the steel industry was imported, mostly from the Federal Republic of Germany, as in previous years.

With a small domestic consumption, Luxembourg relied on steel exports more than any other country, and in the past several years the recession has taken its due toll on employment and profits. ARBED's operations were spread out over Austria, Belgium, Brazil, and the Federal Republic of Germany. At the same time, the company's plants in Luxembourg provided jobs for neighboring French, German, Belgian, and many other foreign workers.

In 1983, the export demand for steel products remained slack, and domestic consumption was closely linked with the implementation of a restructuring plan. The first plan, based on an agreement between the Government, employers, and unions, was rejected by the EEC at the end of 1982. A second, submitted at the end of March 1983, provided for ARBED to spend $302 million over the next 5 years on rationalization. In addition, the work force, which has already been cut by 33%, to 13,800 since 1975, is to be reduced to 12,000 by 1987, and production capacity for steel would be restricted to 3.5 million tons.

Nonmetals.—All extracted minerals in Luxembourg were nonmetals for domestic consumption; of these the most significant were cement, sand and gravel, limestone, and construction stone. All of the operations were privately owned and small by world standards. The production of cement has now been stable for more than 10 years, providing dependable local employment. There was also a modest but stable mining of gypsum.

Mineral Fuels.—Luxembourg was totally dependent on Belgium, the Federal Republic of Germany, the Netherlands, and France for all energy requirements except for some domestic electricity. Of all energy consumed in 1982, 36% came from coal and 35% from oil, the remainder came from gas and electricity. Industry utilized 61% of all energy, of which steel consumed 52%. Only 23% of electric power was generated domestically, 52% of which was from hydroelectric and 48% from thermal power stations, the latter mostly as byproduct of steel production.

In 1982, as previously, all refined petroleum products were imported, almost 85% of which came from neighboring Belgium. Gasoline made up over 32% of those products. The imported quantities in 1982 and 1983 were essentially the same as those of 1981, about 7.5 million barrels.

Natural gas and electricity were imported mostly from Belgium, with some from the Netherlands and the Federal Republic of Germany.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Belgian francs (BF) to U.S. dollars at the 1983 average exchange rate of BF51.2=US$1.00; Luxembourg francs (LuxF) were converted at the rate of LuxF49.65=US$1.00.

[3] Phosphorus and Potassium. The Port of Antwerp—An Important Distribution Centre for Fertilizers in Western Europe. No. 122, Nov.-Dec. 1982, pp. 27-30.

[4] Industrial Minerals (London). Silica Sand—Competition in a Tight Market. Feb. 1984, pp. 19-20.

Table 4.—Luxembourg: Production of mineral commodities[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
Cement, hydraulic	318	325	342	344	340
Gypsum and anhydrite, crude ____ tons	1,044	856	702	443	400
Iron and steel:					
Iron ore and concentrate	630	560	429	([3])	--
Metal:					
Pig iron (including blast furnace ferroalloys)	3,801	3,568	2,889	2,587	[4]2,315
Steel:					
Crude	4,950	4,619	3,790	3,510	[4]3,295
Semimanufactures	3,931	3,746	3,088	2,945	2,800
Phosphates: Thomas slag, gross weight	730	[r]688	595	572	500
Sand and gravel:					
Foundry sand ____ tons	1,400	--	3,500	3,100	3,000
Other sand except glass sand	747	[r]710	713	783	750
Gravel	229	216	191	203	200
Stone:					
Construction:					
Crushed ____ tons	[r] [e]250	282	412	533	550
Dimension:					
Rough cut thousand cubic meters	4	5	9	[e]9	8
Facing ____ thousand square meters	4	4	4	4	4
Finished ____ cubic meters	90	282	564	584	550
Flagstone:					
Polished ____ tons	[r] [e]600	590	1,943	[e]1,800	1,500
Rough ____ do	[r] [e]300	297	275	[e]270	250
Slate slabs ____ thousand pieces	1,171	1,212	1,298	1,199	1,190
Industrial:					
Dolomite	294	385	295	331	330
Quartzite	80	21	6	24	20

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through Apr. 2, 1984.

[2] In addition to the commodities listed, refractory clays and manufactured phosphatic fertilizers other than Thomas slag are produced, but data are not published, and information is inadequate to make reliable estimates of output levels.

[3] Revised to zero.

[4] Reported figure.

The Mineral Industry of Bolivia

By Pablo Velasco[1]

During 1983, Bolivia's tin industry, along with most other minerals, continued the decline that started in 1982. In contrast, the importance of natural gas to export earnings further increased in 1983. Among specific new mineral developments, a new antimony mine in the Potosí area was brought into operation, and a major $150 million gold mining program, including forming a government gold mining company, was being established. Plans were also announced in April for the eventual exploitation of the extensive Mutún iron ore deposits using the Santa Cruz area natural gas as fuel for a modest, direct-reduction steel miniplant. The Karachipampa lead-silver smelter, built by Soviet and West German technicians near Potosí, was scheduled to be inaugurated in January 1984.

The mineral industry of Bolivia contributed about 6.04% to the gross domestic product (GDP) in 1982. Petroleum and natural gas accounted for 1.2% of the GDP compared with 1.0% in 1981. The mineral industry provided 46.2% and the hydrocarbon sector 48.1% of the total value of Bolivia's exports.

Total mineral exports amounted to $373 million, an 11% decline below those of 1982. The production value of tin accounted for 62% of the total value of the nation's mineral exports, 17% below the 1982 total.

Production of tin as well as most other minerals, with a few exceptions, declined. The production decrease was due to a general ore grade decline, older equipment, and labor unrest. The tin industry no longer remained as the cornerstone of the economy. The production of natural gas increased from 1975 to 1982 but declined in 1983. In 1983, natural gas contributed 48.1% of the total export value, principally because of natural gas exports to Argentina. The future of the Bolivian economy, over at least the next decade, will depend on the foreign exchange earnings from the two traditional export sectors, mining and possible natural gas exports to Brazil.

The Bolivian economy has been in recession since 1981 when the Bolivian GDP dropped by 1.5%; in 1982, the GDP fell another 8.7%. In 1983, owing to continuing political instability and adverse world mineral market conditions, the economy declined another 7.6% to the equivalent $1,337 million,[2] preliminary estimates in constant 1970 dollars.

A new Government took office on October 10, 1982, after 18 years of military rule. The economy was suffering a 220% annual inflation rate and by yearend, it reached 297% and had depleted its foreign-exchange reserves. All of this was causing Bolivia serious problems in its economic and political relations with the rest of the world. The new Government failed to reduce inflation, which reached the 328% level in 1983, but it was able to renegotiate its debt with Argentina and Brazil, two of its major creditors. It also reached a tentative agreement with an international banking consortium to which it owes $648.8 million.

Bolivia's external debt, as of December 31, 1983, amounted to $3,310.2 million distributed as follows: $3,169.6 million debt for the public sector, $51.0 million in short-term loans to the private sector, and $89.6 million for International Monetary Fund (IMF) loans.

In November, the Government announced a far-reaching economic reform package designed to put Bolivia on the path to further negotiations with its creditors and the IMF. Measures included a 150% devaluation of the peso from 200 pesos to 500 pesos to a dollar, the elimination of subsidies on transportation and basic foods, and the return to an economy based on the dollar as a hedge against inflation. In 1983, Bolivia paid $125 million to international banking institutions, including $1.4 million in principal.

Banks from the Federal Republic of Germany were evaluating several mining projects of Corporación Minera de Bolivia (COMIBOL) and Empresa Nacional de Fundiciones (ENAF) and approved a $50 million credit for these two state-owned consortium projects early in 1983. About $14 million was scheduled for the year, and COMIBOL was giving priority to the replacement of equipment ($6 million) and the installation of mobile plants ($4 million). Other projects under evaluation include ENAF's Karachipampa silver-lead complex and the low-grade Vinto tin smelter, both of which have been stalled by severe financial and technical problems, and COMIBOL's Los Lipez lead-silver mine in Potosí.

As a result of economic agreements signed in Santa Cruz, Bolivia, the Soviet Union was going to supply additional technical and economical assistance to Bolivia in a number of sectors: mining, industry, exploration of arable land, and hydrocarbons. At the same time, the U.S.S.R. will provide $70 million for the installation of a low-grade tin volatilization plant at Machacamarca, south of Oruro.

Government Policies and Programs.—After almost 15 months in office, which included three cabinet changes, Bolivia's new Government is still in deep trouble, trying to adjust to its worst economic crisis in history. The Government is having to reduce the fiscal deficit by eliminating state subsidies and devaluing the peso to comply with a still-to-be-signed $350 million IMF extension. When the new Government took office, no one expected it to solve the country's chronic balance-of-payments problems. Nevertheless, an agreement was reached in March 1983 between Bolivia and its 144 creditor banks that allowed the country to renegotiate its loan payments.

The Ministry of Mining and Metallurgy has proposed a new mining and metallurgy policy, which must be approved by the executive branch and the Congress before it can become law. Specifically, the ministry wants to (1) reformulate the mining code, (2) centralize minerals and metals marketing in a state agency, (3) create a national metallurgy corporation, (4) barter minerals and metals with centrally planned economy countries, and (5) place priority on the development of gold deposits.

The proposal has come under sharp criticism from the Asociación Nacional de Mineros Medianos, an organization of private medium-size mining companies. The association has particularly criticized the proposed barter with centrally planned economy countries.

In a startling development on April 19, the Bolivian Mine Workers Federation occupied the offices of COMIBOL and declared the institution of "worker management" in place of the current professional management.

Following continual disagreements between the Government and the workers, on May 19, the Government announced the outline of its long-awaited proposal for worker comanagement in COMIBOL. On June 15, the Government decreed a provisional comanagement plan for COMIBOL, which was tentatively accepted by the union. In reaching such an agreement, Bolivia's miners have finally achieved their longstanding aim of "majority" comanagement in the country's largest state-owned enterprise, COMIBOL. The comanagement agreement states that comanagement has the following aims: (1) to defend and consolidate national patrimony in the state-owned mining sector, (2) to prepare, propose, and execute development plans and programs in each of COMIBOL's dependent companies, and (3) to incorporate the workers, through their union representatives, to the management and direction of COMIBOL in order to transform it into an efficient enterprise. Comanagement extends to the whole of the productive process, from broad policymaking down to the adoption of administrative decisions at the lowest level. Comanagement is based on direct election of the worker's representatives, with alternating and revocable mandates, through the unions.

In practical terms, comanagement means that henceforth COMIBOL's board will comprise a president, a vice-president, three Government representatives, and three worker representatives. The president of COMIBOL's board, chosen by the President of the Republic from a short list submitted by the Chamber of Deputies, only will have the right to vote in case of a deadlock. The vice-president, chosen by the President of the Republic from a short list submitted by the miners' federation, must be a Bolivian national and have at least 5 years seniority in COMIBOL. The vice-president has the right to vote. The three Government members will represent the Ministries of Mining, Finance, and Planning. Three worker representatives are to be chosen by the personnel of COMIBOL and accredited by the miners' federation. The general manager of COMIBOL will be appointed by the board, giving the corporation greater independence from the Government in power. COMIBOL's dependent companies will be run by "consejos administrativos" administrative councils answerable to the board.

PRODUCTION

Bolivia's decline in mineral production for the past 2 years was caused by political instability, social unrest, adverse conditions in the world markets, higher costs, inflation, depletion of ore reserves, lack of investments by the public and private mining sector, lack of new mining equipment, management problems, etc.

The decline in the national production of tin concentrate was due mainly to the severe world economic recession. The prices of minerals produced and prices for Bolivia's mineral exports in 1983 continued to be low, and this resulted in continuing problems for the state smelting enterprise, ENAF, whose plants were operating far below installed capacity, with resultant high costs and low productivity.

COMIBOL continued as Bolivia's major mineral producer and one of the most important earners of foreign exchange. COMIBOL produced 63% of the total tin output, a decrease of 10.5% compared with 1982 output. One of the reasons for low production was the scarcity in stocks, tools, and machinery. Another reason was the increasing incidence of theft of minerals, and lower international market prices.

The medium- and small-size private mines produced about 25% and 12%, respectively, of national tin output. These private mining groups achieved an increase in production of about 3% and 7%, respectively. The medium-size private sector mines expanded production of tungsten and antimony to 50% and 74%, respectively, of the national output. The small-size mines produced 26% of the country's antimony production. The tin miners in Bolivia have welcomed the establishment of the new Association of Tin Producing Countries (ATPC), which reconvenes in August. Bolivia is very likely to become a member. The Bolivian hydrocarbon sector continues to be an important producer and exporter of natural gas. In 1983, earnings from natural gas exports exceeded tin exports in importance.

Table 1.—Bolivia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS[3]					
Antimony:					
Mine output, metal content	13,019	15,465	15,301	13,978	[4]9,951
Metal	2,500	5,099	5,116	[e]1,820	2,001
Arsenic, mine output, white arsenic equivalent[e]	--	81	127	[r]261	[4]107
Bismuth:					
Mine output, metal content	10	11	11	5	[4]6
Metal	--	41	6	18	[4]22
Cadmium, mine output, metal content[5]	90	173	165	134	[4]143
Copper, mine output, metal content	1,797	1,884	2,637	[e]2,270	[4]1,982
Gold, mine output, metal content[6] troy ounces	30,319	52,075	66,372	40,146	[4]49,217
Iron ore:[7]					
Gross weight	25,000	5,600	6,477	7,832	[4]10,939
Metal content	15,900	3,570	4,113	4,891	[4]7,001
Lead:					
Mine output, metal content	15,359	17,747	16,757	12,433	[4]11,838
Metal including alloys	588	500	232	236	[4]300
Manganese ore:					
Gross weight[e]	10,500	924	543	120	60
Metal content	3,150	425	250	55	28

See footnotes at end of table.

Table 1.—Bolivia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS[3] —Continued					
Silver, mine output, metal content thousand troy ounces	5,742	6,099	6,394	5,472	[4]6,025
Tin:					
Mine output, metal content	27,648	27,291	29,830	26,773	[4]25,278
Metal, smelter	14,950	18,191	20,005	19,032	[4]14,173
Tungsten, mine output, metal content	2,470	2,732	2,779	2,534	[4]2,449
Zinc, mine output, metal content	51,621	50,260	47,029	45,667	[4]47,132
NONMETALS					
Barite	[7]2,228	8,694	2,130	607	[4]516
Calcite	--	297	271	267	[4]165
Cement, hydraulic	251,000	296,223	374,862	324,923	[4]307,214
Feldspar-related minerals: Sodalite	NA	--	2	1	NA
Gypsum, crude	[e]1,000	1,200	748	756	750
Salt[e]	10,000	10,000	10,000	10,000	10,000
Sulfur	15,000	11,244	10,202	5,914	[4]3,010
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural:					
Gross million cubic feet	159,961	168,818	175,478	187,877	[4]178,059
Marketable do	69,294	78,632	77,542	81,116	[4]66,716
Natural gas liquids:					
Natural gasoline thousand 42-gallon barrels	327	[r]767	767	704	[4]629
Liquefied petroleum gas do	[r]384	585	1,112	624	[4]1,528
Petroleum:					
Crude do	10,174	8,704	8,091	8,918	[4]8,100
Refinery products:					
Gasoline do	4,472	3,684	3,330	3,562	[4]3,088
Jet fuel do	541	713	704	531	[4]565
Kerosine do	1,033	1,021	725	699	[4]647
Distillate fuel oil do	1,830	1,587	1,390	1,701	[4]1,544
Residual fuel oil do	720	97	87	850	[4]927
Lubricants do	156	181	150	171	[4]115
Liquefied petroleum gas do	355	584	1,112	615	[4]475
Unspecified do	[8]1,771	[8]1,898	1,360	1,099	[4]594
Refinery losses[9] do	73	12	9	77	[4]66
Total do	10,951	9,777	8,867	9,305	[4]8,021

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through Aug. 16, 1984.

[2] In addition to the commodities listed, a variety of crude construction materials (clays, crushed and broken stone, dimension stone, and sand and gravel) are produced, but available information is inadequate to make reliable estimates of output levels.

[3] Unless otherwise specified, data represent actual production by Corporación Minera de Bolivia (COMIBOL) and small- and medium-scale mines.

[4] Reported figure.

[5] Cadmium contained in zinc concentrates produced by COMIBOL. (Cadmium is not recovered in elemental form in Bolivia.)

[6] COMIBOL output plus sales by placer mines. (Small- and medium-scale mines cannot legally export gold.)

[7] Data represent exports and are regarded as being virtually equal to production.

[8] Includes topped crude (presumably further processed outside of refineries reported in this table or used without further processing) as follows, in thousand 42-gallon barrels: 1979—669 and 1980—481.

[9] Refinery fuel not reported separately, if at all, in recorded data.

TRADE

Both Bolivian imports and exports of traditional and nontraditional products dropped dramatically. The major cause for the drop in export earnings was the depressed world prices for the commodities produced. The lack of foreign exchange earnings in Bolivia created a shortage of dollars, and the demand for imported goods consequently was reduced significantly. Total exports went down to $806.7 million in 1983 from $877.7 million in 1982. Preliminary estimates showed that export earnings from all minerals declined to $373.0 million from $419.3 million in 1982.

Tin, traditionally Bolivia's main export, totaled only 16,000 tons valued at $208 million, a decrease of 27% and 25% from 1982 figures in volume and value, respectively. COMIBOL's yearend deficit was $160 million, and another loss was expected in 1984. COMIBOL needs a long-term solution to its problems and a complete revitalization according to Bolivian mining officials.

Bolivia's major exports in 1983 were natural gas and tin. Other important exports were largely limited to agricultural products. The value of natural gas exports was $378.1 million compared with $29.2 million in 1974, the first year of gas exports, and $381.6 million in 1982. The contribution of the hydrocarbon sector to the national economy was 48.1% in 1983 against 46.2% contribution of the mineral industry.

Hydrocarbon product exports reached $387.7 million, $10.7 million less than in 1982. No imports of heavier distilled products, such as diesel and fuel oil, were registered in 1983 since internal substitution by liquefied petroleum gas (LPG) and some natural gas has been successful.

The Bolivian Congress proposed the formation of a minerals and metals marketing institute, Instituto de Comercialización de Metales y Minerales. The new agency would supervise and conduct sales and purchases of mineral production, except tin, in domestic and foreign markets. The agency would have three representatives from COMIBOL, two representing medium-size mines, one from the small mines, and one from mining cooperatives. The Government was also considering creating a national smelting corporation to oversee new projects such as the Karachipampa lead-silver smelter, the La Palca tin volatilization plant, and the Machacamarca tin volatilization plant.

Table 2.—Bolivia: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983
Antimony:		
Ore and concentrate	7,462	8,728
Trioxides	2,291	2,559
Regulus (impure metal)	1,048	1,562
Alloys, all forms	90	71
Arsenic: Ore and concentrate	105	51
Barite and witherite	607	516
Calcite	76	--
Copper: Metal including alloys, all forms	2,139	1,926
Gold: Metal including alloys, unwrought and partly wrought troy ounces	--	1,417
Gypsum and plaster	756	--
Lead: Metal including alloys, all forms	11,557	9,342
Lime	191	165
Manganese: Metal including alloys, all forms	55	28
Silver: Metal including alloys, unwrought and partly wrought thousand troy ounces	4,850	5,074
Sulfur, all forms	5,914	3,010
Tin:		
Ore and concentrate	3,238	2,509
Metal including alloys, all forms	18,875	13,967
Tungsten: Concentrate (WO_3)	3,272	2,584
Zinc: Metal including alloys, all forms	44,543	41,352

[1] Table prepared by John G. Panulas. Table includes partial provisional export data; information on export destinations and on imports was not available at the time of publication.

COMMODITY REVIEW

METALS

Antimony.—Since 1978, Bolivia has been the world's leading antimony producer, surpassing the output of China and the Republic of South Africa. Production of antimony in ore and concentrate in 1983 declined 29% and antimony metal increased 10% compared with 1982 output.

Bolivia's largest producer of antimony, Empresa Minera Unificada S.A. (EMUSA), which supplies ore and crude oxide to the U.S. firms Amspec Chemical Corp. and M&T Chemicals Inc., closed its Caracota Mine, which had accounted for about 40% of its output of antimony ore and concentrate. EMUSA also closed down other mines for maintenance work. The eventual length of the closures depends on higher antimony prices. Plans have been announced in Bolivia for a sizable increase in the production of metal and antimony oxides in the near future. The state-owned antimony smelter, ENAF, is expected to raise its overall production of metal and oxides to over 2,000 tons in 1984.

The Empresa Minera Bernal Hermanos S.A., producers of antimony concentrate and metals, was planning to add four new rotary furnaces to its Tupiza Province antimony smelter in Potosí in order to increase its production of antimony oxide to 4,000 tons per year. About 75% of the expanded output was expected to be shipped to the United States. To feed the new units, the 1,500-ton-per-year Rosa de Oro Mine in Potosí was to be brought on-stream. In addition, plans were made to buy an additional 4,000 tons per year of ore from Banco Minero de Bolivia (BAMIN) and 2,000 tons per year from EMUSA and other sources. These increased internal demands for antimony ore would result in less export of ores and concentrates in 1984 and more of metal oxides. According to preliminary statistics, ENAF's antimony smelter near Oruro increased output of antimony metal 10% in 1983 compared with that of 1982; however, this was about 40% below the full rated capacity of 5,000 tons per year. Of the total output, 74% came from the medium-size mines and 26%, from the small-size mines. Bolivia's exports of antimony increased 19% in volume and declined 8.2% in value. About two-thirds of the exports were concentrates, and the balance, metals.

Gold.—Gold production increased 23% compared with that of 1982, according to purchases made by BAMIN. Purchases were made from gold mining cooperatives and the South American Placers Inc. (SAPI). Small miners composed of mining cooperatives produced 92% of the total output. The remainder of the gold output came from the medium-miners sector, in particular from dredging operations in the Kaka River by SAPI.

The Ministry of Mining and Metallurgy has also begun a project to map and classify the country's gold zones, quantify reserves, and define areas to be developed. Bolivia's alluvial gold reserves have been estimated at 6 billion cubic meters of gravel grading an average of 0.008 ounce of gold per cubic meter.

The Government of Bolivia has also decided to create a national gold company, Yacimientos Auríferos Bolivianos (YAB), which reportedly will have a $50 million funding. The new company will be responsible for all gold exploration, development, exploitation, and marketing in Bolivia. The decision to form a new company has been met with some skepticism from the mining industry and labor unions. Mining officials have pointed out that black-market problems remain. Although official annual production is about 50,000 ounces of gold, an estimated 290,000 ounces are produced and sold illegally each year. In October 1983, the new civilian Government announced the creation, by a supreme decree, of YAB as part of a new plan called Plan Nacional de Rehabilitización y Desarrollo.

Iron Ore.—Empresa Siderúrgica Boliviana S.A. (SIDERSA) continued producing and exporting iron ore concentrates from the iron and manganese deposits of Mutún, which are near the Bolivian-Brazilian border. SIDERSA exported to Argentina 7,000 tons of iron ore concentrate, an increase of 43% compared with 1982 exports. The Mutún deposits have been the subject of several studies to determine the reserves, which have been estimated at 40 billion tons of iron ore. The project has been exhaustively studied as part of the National Steel Plan. Numerous other studies have been made from 1945 to the present time.

Iron and Steel.—SIDERSA, the Bolivian Government's iron and steel enterprise, announced in April 1983 that the long-planned Mutún iron ore and steel project would be implemented as soon as the $200 million financing for the integrated steel plant was available. SIDERSA officials indicated that the feasibility study completed by Arthur G. McKee & Co. in 1975 was being updated by the Brazilian firm Cía. Brasileira de Proyectos Industriaís (COBRAPI). The updated COBRAPI study envisages the exploitation of the Mutún iron ore reserves as the raw material for a proposed direct-reduction steel miniplant capable of producing 100,000 tons per year of nonflat products for domestic consumption as well as some rolled products for export. This natural gas-based direct-reduction plant would be located in the industrial zone of the city of Santa Cruz and close to the natural gasfields.

Approximately 50% of the production of the steel miniplant would be for export. SIDERSA indicated that negotiations were far advanced with three foreign companies, from Brazil, Italy, and Mexico, to obtain technology and financing for the project. SIDERSA observers say that the smaller project appears more feasible than the more ambitious venture that has been discussed but delayed for years. The miniplant will have a better chance of selling its output and being competitive on export markets. Among the problems holding back the venture is the cost of the gas pipeline and the price of natural gas. However, at yearend another proposal was emerging, which was a joint venture of SIDERSA and the Regional Development Corp. of Santa Cruz (CORDECRUZ) to build a 65,000-ton-per-year direct-reduction rolling plant to supply domestic needs only.

Lead, Silver, and Zinc.—Production of lead declined 4.8% compared with that of 1982. COMIBOL continued to be the largest lead producer in the country with 63% of the total output. The medium-size mines produced 28%, and the small mines, 9%. Silver was mainly produced as a byproduct of lead and tin. Silver production increased 10.1% compared with that of 1982. COMIBOL accounted for 79% of the total production; the medium-size mines, 12%; and the small mines, 9%. Exports of silver increased 4.6% in volume and 57.2% in value, compared with those of 1982.

The Quioma Mine, operated by Cía. Minera Quioma S.A., is the dominant base-metal producer among the medium-size mines. Output of this mine, in which the U.S. firm ASARCO Incorporated is a major stockholder, was down in 1983. Reserves of the mine are reported at almost 3 million tons, averaging 4.5 ounces of silver per ton, 6.21% lead, and 7.28% zinc.

After 5 years of construction, the Karachipampa lead-silver smelter outside of Potosí was scheduled to start operations on January 17, 1984. The installation phase was completed in September 1983, and startup tests were being conducted through November. The plant was designed to produce over 24,000 tons per year of lead (99.9% lead) and 200 tons per year of silver (99.9% silver). Other minerals that could be produced at Karachipampa include 2,000 tons per year of antimony, 800 tons of tin, 3,000 tons of zinc, 500 tons of copper, and 30 tons of bismuth. When the Government of Bolivia signed the contract with Klöckner Industrie Anlagen GmbH of the Federal Republic of Germany, Sidech S.A. of Belgium, and Machinoexport S.A. of the U.S.S.R. in 1978, the cost of the plant was estimated at $123 million. The final cost was $250 million. COMIBOL is scheduled to meet with Karachipampa officials to discuss the domestic availability of lead-silver concentrate. Bolivia does not produce enough of this concentrate to supply the smelter.

A project to develop the Bolivar lead-silver deposit was delayed. This mine is located 105 kilometers south of Oruro, in the Antequera-Avicaya tin district. The Government of Bolivia has begun a search for international funding to provide more than $50 million of financing required for the Bolivar silver-lead-zinc-tin project. The Ministry of Mining and Metallurgy has sent a feasibility study on the project to the United States, the Soviet Union, and European countries including Belgium, France, the Federal Republic of Germany, and Spain. The $50 million investment in the Bolivar polymetallurgical plant has already passed the feasibility stage. The objective is to modernize the system of mining and construct a 750-ton-per-day flotation plant for the production of lead, silver, zinc, and tin. The plant will process approximately 274,000 tons of ore per year, from which COMIBOL hopes Bolivar will produce annually about 4,300 tons of lead-silver concentrates and over 75,000 tons of zinc-silver concentrates. With this planned expansion, COMIBOL would be assured of providing adequate feed to the Karachipampa lead-silver smelter in Potosí, which is due onstream in early 1984.

Tin.—The tin industry, which had a peak output of 29,830 tons in 1981, no longer continued as the cornerstone of the Bolivian economy because its output has been declining in the past 2 years. Nevertheless, Bolivia has managed to maintain its position as the world's fourth largest producer of tin concentrate and metal. Production of tin ore and concentrate and tin metal reached 25,278 and 14,173 tons, respectively, a decrease of 5.6% and 25.5% compared with 1982 output. Tin exports totaled 16,041 tons for a total value of $208 million in 1983, of which 72% was tin metal, 16% in concentrate form, and the remainder in other forms. COMIBOL accounted for 63% of the total tin output followed by the medium-size mines with 25%, and the remaining 12% by the small mines and cooperatives. COMIBOL's tin output was expected to be about 18,000 tons of concentrate, but it reached only 16,000 tons.

Another serious problem leading to lower output has been mineral theft, mainly in the Huanuni Mine where average monthly production has dropped from 350 to 400 tons in 1980 to 250 tons monthly in 1983. According to estimates by Huanuni's officials, thefts amount to monthly losses of about 84 tons (equivalent to $1.0 million) without taking into account the production costs of the missing mineral. Because of these losses, Huanuni opposed the system of comanagement recently adopted by the company, which makes the mine workers responsible for the fight against theft. Nobody knows for certain how much is being stolen from the other 14 companies, but all have the same problem according to COMIBOL officials.

COMIBOL was actively studying the possibility of re-treating the accumulated tailings from the sink-and-float plant and concentrator (Victoria Mill) at the Kenko Reservoir, near Catavi. Plans are under consideration to dredge this material at a rate of 3,000 tons per day and treat it in the mine flotation plant. The existing tailings are estimated to amount to 10.8 million tons of material, grading 0.44% tin. The overall project could yield 2,800 tons per year of tin concentrate.

COMIBOL's falling production is the result of many factors. Declining grades at depth on old mines, frequent changes in the company's top management, obsolete mill equipment, theft, and a lack of success in exploration. (COMIBOL has not found a new tin deposit since 1952.) However, in recent years a team of scientists from Servicio Geológico de Bolivia (GEOBOL) have begun exploring for tin deposits in the volcanic zones of the Oruro and Potosí areas. According to U.S. Geological Survey geologists, who are directing the survey, preliminary investigations suggest the existence of tin and other metalliferous mineral deposits in the region of Morococala and Frailes at depths between 20 to 200 meters. This is a continuation of a new exploration program that began in August 1980, jointly sponsored by the United Nations Development Program ($420,000) and the Government of Bolivia ($200,000).

ENAF's production of refined tin in 1983 also declined 25.5% compared with 1982 output. The two tin smelters, with an installed capacity of 20,000 and 10,000 tons, in 1982 operated at 63% of capacity and in 1983 at 43% of capacity because of a shortage of feed and irregular shipments of coal, which is used as a fuel and reducing agent. ENAF has been unable to obtain the coal. In the last 3 years, ENAF lost $100 million. The Ministry of Mining and Metallurgy has said it will issue a decree authorizing ENAF to import a wide variety of essential material free of duty. Both ENAF and COMIBOL were lacking in funds to purchase essential materials and supplies. In the marketing area, both COMIBOL and ENAF continue to disagree on sales control. COMIBOL still wants to provide tin concentrate to ENAF on a toll basis, instead of outright sale, but ENAF wants to retain sole selling rights over refined tin.

At yearend, it was announced that COMIBOL's Board of Directors was going to approve on January 8, 1984, the continuation of construction of the tin fuming (volatilization) plant at Machacamarca, 20 kilometers south of the city of Oruro. The Machacamarca plant will be the second to be built in Bolivia by the Soviet firm Machinoexport. COMIBOL has already spent $30 million on this plant, which is expected to cost a total of $70 million. The Machacamarca plant will have two 200-ton-per-day-capacity fuming furnaces. The La Palca plant has one 400-ton-per-day-capacity furnace.

Tungsten.—Bolivia ranked third as a world producer of tungsten after China and the U.S.S.R. Output declined 3.4% compared with that of 1982. One-half of the total output was produced by medium mines, 43% by COMIBOL, and 7% by small mines. Bolivia exported 3,272 tons of tungsten concentrate (WO_3) in 1982 for a total value of $33.8 million and in 1983, exported 2,584 tons of WO_3 for a total value of $20 million, a decline of 21% in volume and 41% in value, compared with 1982 exports.

A drop in the tungsten price to $74 per ton unit (72% WO_3) in August from $82 in late July has jeopardized the Bolivian mining operations. Current prices are at their lowest since World War II. During 1983, producers and consumers met in Geneva to discuss what measures could be taken to improve prices. The major producers, led by Bolivia and China, want a price stabilization agreement to be supported by nationally held reserve stocks.

Churquini Enterprises Inc., a subsidiary of the Anschutz Mining Corp. of the United States, recently announced that the Chicote Grande Mine, high in the Bolivian Andes about 150 miles southeast of La Paz, can be expected to commence operations in mid-1984. A production rate of 180,000 tons per year of ore is planned. The reported recoverable resource was estimated to be 2.7 million tons of ore averaging 0.66% WO_3, which could maintain an operation for almost 15 years. Further metallurgical testing and mineralogical analyses of pilot plant products are underway to improve the overall recovery of tungsten from the present 55% level to possibly 75%.

NONMETALS

Nonmetallic minerals have been traditionally of minor importance in the mineral industry of Bolivia, although the need for these minerals has increased tremendously in the last decade, as a result of expanded markets in different regions of the country. Bolivia has a large number of different types of nonmetallic mineral deposits, of which only a few have been studied in detail. Such nonmetallic deposits occur widely in different parts of the country. However, since there is insufficient data known about the deposits, internal needs are now satisified through imports, which use badly needed foreign exchange. According to GEOBOL, the geological environment for nonmetallic minerals is favorable in the entire country. GEOBOL has stated that the Government of Bolivia is firmly committed to programs for the exploration for nonmetallic minerals. Emphasis is to be placed on those needed most to supply internal needs for existing or proposed installations. The technical personnel to be assigned to this comprehensive 3-year program to inventory, investigate, and evaluate the nonmetallic mineral deposit, will include at least six senior geologists and all required support personnel.

Cement.—Production of cement in Bolivia decreased 5.5% compared with that of 1982 and 18% compared with that of 1981. The three cement companies operating in Bolivia were Cía. Boliviana de Cementos S.A.M. (29% of output), Fábrica Nacional de Cementos S.A. (42%), and Sociedad Boliviana de Cementos S.A. (29%). In 1982, the country's cement production was about 52% of installed capacity, and in 1983, was approximately 48%.

A 150,000-ton-per-year cement plant was still planned for Sevaruyo, 175 kilometers south of Oruro. A projected enlargement to 300,000 tons per year was being considered, and bids on the project were requested several months ago. Construction awards were expected to be made by late 1983, and kiln startup was scheduled for mid-1986. Engineering design was by LaFarge Consultoría et Estudos, Montreal, Canada. Two other plants were under consideration: A 345,000-ton-per-year, $105 million plant for Yacuses in eastern Bolivia and a 60,000-ton-per-year, $19 million miniplant for El Puente in Mendez Province. The Yacuses plant was being planned by CORDECRUZ; startup is scheduled for 1987. The Regional Development Corp. of Tarija was in charge of the El Puente project.

Salt.—Bolivia has unlimited quantities of salt reserves, but the locations with resultant transportation problems make exploitation difficult. Production of salt in 1983 and previous years was estimated to be about 10,000 tons. The Government of Bolivia is reportedly considering seriously a joint mining venture with a Canadian company that is interested in developing the Salar de Uyuni. This large salt lake is considered to be one of the largest salt crusts in the world (10,000 square kilometers) and is located in the central depression of the Bolivian Altiplano. The thickness of the crust is believed to be 12 to 13 meters, and reserve estimates indicate that it may contain 5 million tons of lithium (which would equal the total known world reserves), 3 million tons of boron, and 100 million tons of potassium.

Sulfur.—Sulfur has the greatest export dollar value of the nonmetallic minerals in Bolivia. Production of sulfur has been in a downtrend since 1979 to a reported figure of 3,010 tons in 1983. Occurrences of sulfur are known along the Chilean border for a distance of approximately 550 kilometers. The deposits are in volcanic hills, which form a part of a chain extending from southern Peru to Mendoza in Argentina. Most of the output is exported to Chile.

MINERAL FUELS

The Bolivian hydrocarbon sector continues to be of growing importance for the nation's economy, providing substantial support to the balance of payments and providing the country with self-sufficiency in hydrocarbon products. The domestic market for refined petroleum products was fully satisfied, despite Bolivia's worst economic crisis in history and worldwide depressed economies. The hydrocarbon sector contributed 48% of the total export value, which amounted to $806.7 million in 1983. The contribution of crude oil exports to the nation's economy remained insignificant with only small amounts of refined gasoline and LPG exported to neighboring countries.

Natural Gas.—Production of natural gas declined 5.2% compared with that of 1982. The decrease in output was due to the natural decline in gas reserves from some gasfields of Yacimientos Petrolíferos Fiscales Bolivianos (YPFB) and Occidental Boliviana Inc. Argentina continues to be Bolivia's sole foreign customer for natural gas. Exports to Argentina decreased 3% to 78.5 billion cubic feet of natural gas, compared with that of 1982. Revenues from natural gas exported to Argentina decreased 1% to $378.15 million, compared with those of 1982. Bolivian natural gas production continues to be determined by the export volume to Argentina since internal consumption continues to be minimal at 5.8 billion cubic feet, having dropped 0.5% compared with 1982 consumption.

Future domestic consumption is expected to increase once the projected gas pipelines are completed. On January 14, 1983, Argentina agreed to increase the gas price to $4.28 per million British thermal units, but reduced the volume to be purchased. The agreed price was part of overall negotiations on the $556 million debt owed by Bolivia to Argentina. During the year, Argentina withheld its gas payments, forcing Bolivia to agree to a payment schedule of its debt tied to future gas sales. As of December, Argentina owed Bolivia $245 million for unpaid gas bills.

In January, YPFB awarded Trenthan Corp. of Houston, Texas, a contract for the design, engineering, and construction of a natural gas processing plant in the Vuelta Grande Gasfield, 200 miles southwest of the city of Santa Cruz. The plant will process 100 million cubic feet of natural gas daily to recover more than 7,500 barrels per day of LPG and will reinject excess gas into the reservoir.

For several years Brazil has been discussing with Bolivia proposals to supply natural gas to the São Paulo area from the Santa Cruz fields. Large new discoveries of natural gas in Brazil's upper Amazon region are speeding up plans to construct the Santa Cruz-São Paulo gas pipeline. Costs for the pipeline were estimated in 1980 to be $400 million on the Bolivian side and $700 million on the Brazilian side. If the project were to be implemented in 1986, the costs were estimated at $700 million for Bolivia and $1,100 million for Brazil based on 1980 dollars.

The final price to be paid by Brazil for the Bolivian gas has not yet been agreed upon. However, it has been agreed in principle that the negotiating basis for the gas price will be the energy equivalent to the fuel oil price at São Paulo. A meeting set for March 1983 was postponed until mid-1984, owing to delays on the certification of Bolivian gas reserves studies. Natural gas reserves in 1983 were estimated at 5.53 trillion cubic feet. These reserves are still not adequately quantified, although YPFB's exploratory drilling was completed in 1982. In July 1983, YPFB signed contracts with two companies (Buttler of Houston, Texas; and PTTS of Norman, Oklahoma) to do the certification project of Bolivian gas reserves.

According to the Gas Development Corp. estimates, the 4.5 trillion cubic feet of gas reserves needed to implement the final sales contract would be divided as follows: (1) internal consumption for 20 years—0.8 trillion cubic feet of gas, (2) exports to Argentina for 9 years—0.7 trillion cubic feet of gas, and (3) exports to Brazil for 20 years—3.0 trillion cubic feet of gas.

Petroleum.—Production of crude oil and condensate fell by 9.2% to 8.1 million barrels compared with 1982 output, thus returning to the downtrend in production that started in 1974. The decline in production was due to reduction in output in both YPFB and the contractors' fields, mainly in the Santa Cruz division fields. Bolivia has currently 19 crude oil-producing fields, all belonging to YPFB. Eleven oilfields decreased production during the year.

Processed petroleum and refinery production dropped as internal consumption and output feed dropped. The retail prices in pesos for refined products were raised on November 18, following a 60% devaluation of the Bolivian peso to the dollar. Increased prices failed to compensate for the decline in value of the peso. Thus, Bolivian prices for refined hydrocarbon products in 1983 still remained significantly below world and regional standards. Regular gasoline (82 octane) was 45.42 cents per gallon and premium (92 octane) was 76 cents per gallon.

As of December 31, 1983, total liquid reserves (crude oil plus lease condensate) were 175.3 million barrels. During the last 4 years, as a result of YPFB's program of substitution of gas products for liquids, internal consumption of LPG has sharply increased from 61,000 cubic meters in 1979 to 273,000 cubic meters in 1983. YPFB has three gas plants at Río Grande, Colpa, and Camiri that produce LPG and natural gasoline.

Bolivia Andina Petroleum Corp., a subsidiary of the Anschutz Corp. of Denver, Colorado, and the Royal Dutch/Shell Group of the Netherlands, during 1982 signed an operational contract with YPFB to explore over 7 million acres north of La Paz and was the only company exploring actively in 1983. Of the previous 20 operational contracts signed with YPFB, the other 2 companies remaining active in the country are Occidental Boliviana Inc. and Tesoro Bolivia Petroleum.

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[1] Physical scientist, Division of Foreign Data.

[2] The Central Bank of Bolivia placed 1983 GDP at 16,104 million pesos at 1970 prices. The Bolivian peso ($b) was officially converted to U.S. dollars at the following rates: Sale $b200=US$1.00 and purchase $b196=US$1.00 until Nov. 22, 1983, when the Bolivian peso was devalued to sale $b510=US$1.00 and purchase $b500=US$1.00 until Dec. 31, 1983.

The Mineral Industry of Botswana

By Thomas O. Glover[1]

The economy was boosted in 1983 primarily from the increased production and sale of diamonds, chiefly from the Jwaneng Mine. Surplus revenues of nearly $66 million[2] were expected for the year. Two-thirds of Botswana's total export revenues were from the sale of diamonds.

All contracts were let and construction started on the new $275 million power station, near the existing coalfield at Morupule. The station, scheduled for completion in 1986, will be air-cooled.

Botswana's takeover from the Zimbabwe Government of the ownership and operation of the main north-south railway through Botswana was proceeding on schedule. Transfer was scheduled for the end of 1986.

The Government of Botswana invited bids from eight foreign consultants for a feasibility study of the Trans-Kalahari railway. The contract was awarded to a British consulting firm. The railroad would make it possible to transport coal mined in the Kgaswe coal basin across the Kalahari Desert to a coastal terminal at Walvis Bay in Namibia.

PRODUCTION

Mineral production in Botswana generally increased, except for coal, which had a small decrease. Output of copper-nickel matte increased 5%, and the production of diamond increased 38%. Botswana was second in the world in total production of diamond and in production of gem diamond. Coal production decreased about 5%. The contained metal in the matte averaged 42.14% copper, 37.88% nickel, and 0.46% cobalt. Total production of nickel, copper, and cobalt came from the Selebi-Phikwe underground mines. Coal production came from Botswana's only operation, the Morupule Colliery.

Table 1.—Botswana: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983[p]
Coal, not further described	355,115	370,914	379,270	414,778	[2]395,127
Cobalt, Co content of nickel-copper matte[3]	294	226	254	254	223
Copper:					
Mine output, metal content[4]	17,419	20,841	19,954	21,161	[e]24,000
Cu content of nickel-copper matte[3]	14,563	15,553	17,819	18,375	[2]20,261
Diamond:					
Gem[e] thousand carats	659	765	740	NA	NA
Industrial[e] do	3,735	4,336	4,220	NA	NA
Total do	4,394	5,101	4,960	7,769	[2]10,731
Gem stones, semiprecious, rough, not further described kilograms	5,000	20,000	--	1,100	NA
Nickel:					
Mine output, metal content[4]	22,109	23,637	21,925	20,669	[e]21,000
Ni content of nickel-copper matte[3]	16,173	15,442	[r]18,278	17,756	[2]18,216
Nickel-copper matte, gross weight	39,823	40,099	46,565	45,685	[2]48,083
Sand and gravel cubic meters	229,856	201,925	156,921	NA	NA
Stone, crushed, not further described do	228,526	222,033	184,355	NA	NA
Talc	104	78	70	--	--

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through May 7, 1984.

[2] Reported figure.

[3] Figures approximate recoverable mine output and have been used in world production tables appearing in volume 1 of Minerals Yearbook.

[4] Analytic content of ore milled.

TRADE

Botswana is a member of the South African Customs Union (SACU), and as such, its exports are counted in the Republic of South Africa's trade statistics. Exports were the Government's principal source of income. Botswana's two major export commodities were diamond and nickel-copper matte and pellets. Export of diamond did not keep up with diamond production. This was because of a quota system, under which the Central Selling Organization (CSO) operates, that withholds diamonds from the depressed world market. As a result of a quota cutback, Botswana holds a large stockpile of unsold diamonds. Bamangwato Concessions Ltd. (BCL) ceased selling the copper-nickel pellets to Rio Tinto Mining of Zimbabwe in April and commenced shipping the entire pellet production to AMAX Nickel Inc.'s Braithwaite, LA, refinery. Prior to April, all shipments to AMAX were matte.

COMMODITY REVIEW

METALS

Financial support for BCL, which mines and smelts nickel-copper-cobalt ore from the Selebi-Phikwe deposits, was provided for under a February 1983 agreement with AMAX Inc. AMAX was a 29.8% equity owner in Botswana Roan Selection Trust Ltd., which in turn holds 85% of BCL. The BCL Selebi-Phikwe nickel-copper mines were beset by poor copper and nickel market conditions. A new lower cost smelter process was perfected in 1982 to pelletize the smelter's nickel-copper product. The pellets were first sent to Zimbabwe, when AMAX could not accept all of BCL's nickel-copper matte production at its Louisiana refinery. AMAX agreed to take delivery of BCL's total production of pellets on April 1, 1983. Prior to this time, AMAX had received all shipments as nickel-copper matte. The new method injects the molten nickel-copper into water, creating a controlled explosion that pelletizes the material.

Comparing 1983 and 1982 production, copper content of the smelter product increased 10% to 20,261 tons, nickel content increased 3% to 18,216 tons, and cobalt decreased slightly to 223 tons. Reserves in the Selebi deposit were estimated, as of December 31, 1982, at 23 million tons, averaging 0.77% nickel and 1.02% copper. In the Phikwe deposit, reserves were estimated at 22 million tons, averaging 1.09% nickel and 1.02% copper.

NONMETALS

Botswana produced approximately 10.7 million carats of diamond in 1983, up about 3 million carats from that of 1982. The large increase in production was attributed to the increase in production at the newly opened Jwaneng Mine. Diamond production in Botswana began with the startup of the Orapa Mine in 1971, followed by the Letlhakane Mine in 1977 and finally the Jwaneng Mine on August 14, 1982.

The Jwaneng Mine was jointly owned by the De Beers Consolidated Mines Ltd. (51%) and the Botswana Government (49%). The mine area was overlain with 12 to 15 feet of sand that had to be removed before mining began. The Jwaneng deposit consisted of three lobes, one larger and two smaller, with the larger lobe located between the two smaller lobes. Approximately 400,000 tons per month of kimberlite was mined. Only the large lobe was mined in 1983, with the two smaller lobes held in reserve. The larger center lobe was mined in 10 benches, and will be 1.5 kilometers long, 800 meters wide, and 200 meters deep when mining operations are completed. All three lobes were to be operational in 1984-85. The crusher at Jwaneng was set to crush all kimberlite down to 25 millimeters. The kimberlite was separated into three grades, low, medium, and high. Low-grade kimberlite contains less than 25 carats per ton; medium-grade, 25 to 50 carats per ton; and high-grade, more than 50 carats per ton. High-grade kimberlite occurs at plus 55 meters depth in the red bed.

A new diamond sorting center in Gaborone was opened in January 1983. The center processes all of the diamonds from the three mines. One-half million carats in diamond concentrates from the Letlhakane Mine and 4.5 million carats in concentrates from the Orapa Mine are sorted together at Orapa before sending them to the Gaborone sorting center. The balance of production came to the sorting center from the Jwaneng Mine. All Debswana's production was sold to the Diamond Corp. of Botswana, a part of the CSO. CSO sales take place in Gaborone every 5 weeks.

MINERAL FUELS

Botswana, with 17 billion tons of identified coal resources, has the largest deposits of coal in Africa outside the Republic of South Africa. Seven companies have conducted exploration drilling over the past several years. The companies are Shell Coal Botswana Ltd., Charbonnage de France International Botswana (French Government), British Petroleum Botswana Ltd., AMAX Exploration Inc., Ruer Coal Botswana Ltd., Anglo American Coal Corp. Ltd., and one other unknown company from France. Coal resources, in the Karoo Formation, in western Botswana are of very poor quality; however, coal resources in eastern Botswana are of better quality.

The only coal producer in Botswana, Morupule Colliery near Palapye owned by Anglo American, produced 395,127 tons of coal in 1983 valued at $4.7 million. Morupule coal was all consumed within Botswana. Work was progressing on a new 90-megawatt, air-cooled, coal-fired powerplant near Morupule. The Morupule open pit coal mine must double its present production to supply the new powerplant.

The Government of Botswana and Shell Coal have jointly entered into a steam coal mining project. Shell has a 20-year renewable lease on an area west of and adjoining the Morupule coal mining area. A feasibility study was undertaken by Shell on the project. If the coal were mined by Shell, it would for the most part be exported to other countries. Morupule Colliery coal is less than 100 meters below the surface and is surface mined; whereas, the depth of coal in the Shell lease area was greater than 100 meters and must be mined by underground methods.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Botswana pula (P) to U.S. dollars at the rate of P1=US$0.91.

The Mineral Industry of Brazil

By H. Robert Ensminger[1]

In 1983, mineral production comprised 4.0% of the gross domestic product (GDP) compared with 2.0% in 1982. Gold's share of the total value of mineral products increased from 4.5% to 11.0%, which resulted in its replacing iron ore as the second most valuable mineral commodity behind petroleum.

The estimated value of Brazil's mineral production increased 36.3% relative to 1982 in current prices, and 12% in 1977 prices. Despite the negative growth in the overall industrial sector, the extractive mineral industry (excluding petroleum), grew between 10% and 12%. Brazil produced 67 mineral commodities with the top 11 representing 90.2% of the total value. Petroleum remained first in total value at 42.7%.

Brazil has the world's largest reserves of columbium (niobium), quartz crystals, and probably barite, gypsum, and titanium. When the bauxite and tin reserves are fully assessed, the country may well have the largest bauxite reserves in the world and tin reserves that will rank very high. Brazil has critical mineral shortages of metallurgical coal, sulfur, molybdenum, silver, and platinum.

The Brazilian economy took a downturn in 1983 contracting approximately 5% in real terms. The GDP, at current prices, decreased from $295.3 billion in 1982 to $211 billion[2] in 1983. The 1983 inflation rate was 230% compared with 98% for 1982.

Government Policies and Programs.—The Serviço Federal de Processamento de Dados reached an accord with Departamento Nacional da Produção Mineral (DNPM) to provide mineral data from DNPM to end users by telex. Subscribers to this service are able to request information 24 hours per day from DNPM in Brasília.

The year 1983 was difficult for DNPM because, like other Government entities, there was a shortage of finances to carry out desired programs. Only six basic mapping projects were undertaken through Cia. de Pesquisa de Recursos Minerais. The geological mapping and geophysical exploration work was finished on the lead-zinc prospect in the Vale do Rio Ribeira in the States of São Paulo and Paraná. A new deposit was discovered west of the Perau Mine that increased the ore reserves from 1.5 million to 3.0 million tons of 5% lead and 7% zinc.

The National Prospecting Program for coal, lignite, and peat was continued as part of the Energy Mobilization Program. In the past 3 years, the program has quadrupled the coal reserves of southern Brazil. This has permitted the expansion of 10 mines and the opening of 10 new mines. In northwest Brazil 600 million cubic meters of usable peat was discovered. In the State of Amazonas on the Peruvian border approximately 26 billion tons of lignite was delineated.

The Brazilian Government continued to give high priority to the Carajás regional development project in 1983. The project should provide Brazil with approximately $15 billion per year in export earnings by 1990. The Government announced that about $39 billion will be invested in the mining operations, with another $22 billion to be used in developing the required infrastructure. The Carajás iron ore project is scheduled to begin operation by midyear 1986, and orders for 25 million tons per year have already been placed. Delays have resulted from financial restraints placed on Cia. Vale do Rio Doce (CVRD), the Brazilian state mining company.

PRODUCTION

Preliminary estimates set the value of 1983 mineral production at $8.3 billion, which was $1.5 billion above the figure for 1982. Eleven mineral products comprised 90.2% of the value of mineral production: petroleum; gold; iron ore; sand and clay, etc.; natural gas; coal; lime; phosphate; tin; bauxite; and manganese. Fossil fuels comprised 52.6%. The metallics made up 25.3%, and the nonmetallics, 22.1%. Gold replaced iron ore as the second most valuable mineral commodity after petroleum. The total value of gold produced was approximately $943 million compared with $784 million for iron ore.

Based on 1982 data, Brazil was the world leader in the production of columbium, tantalum, and probably beryllium. Brazilian iron ore ranked first or second in competition with Australia. Bauxite, in which Brazil has the potential to be a world leader, and manganese are other important minerals mined in Brazil.

The Instituto Brasileiro de Mineração forecast the 1984 value of mineral production to increase approximately 15% over that of 1983.

Table 1.—Brazil: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum:					
Bauxite, dry basis, gross weight	2,387,741	5,537,676	5,770,448	6,289,713	7,000,000
Alumina	449,100	492,700	496,639	606,177	580,000
Metal:					
Primary	238,310	260,611	256,418	299,054	401,000
Secondary	43,687	53,180	36,688	47,149	43,016
Antimony, mine output, metal content	73	46	269	--	--
Beryllium: Beryl concentrate, gross weight	452	550	853	1,062	1,250
Cadmium, metal, primary	21	40	45	73	[3]189
Chromium:					
Crude ore	891,543	833,935	926,413	668,000	670,000
Concentrate	229,836	187,396	152,859	158,500	159,000
Marketable product[4]	340,385	313,067	236,390	275,500	276,000
Columbium-tantalum ores and concentrates, gross weight:					
Columbite and tantalite	374	538	299	201	140
Djalmaite concentrate	10	18	13	[3]4	3
Pyrochlore concentrate	28,909	30,700	29,886	19,593	19,663
Copper:					
Mine output, metal content	5,262	1,403	13,945	[4]19,163	24,000
Metal, secondary	53,110	63,000	45,000	57,000	39,920
Gold:					
Mine output troy ounces	107,158	131,500	150,000	260,421	NA
Garimpeiros (prospectors)[5] do	212,100	1,168,500	1,050,000	1,186,361	NA
Total do	319,258	1,300,000	1,200,000	1,446,782	[3]1,704,000
Iron and steel:					
Ore and concentrate, marketable product:[4]					
Gross weight thousand tons	104,083	114,732	97,860	95,000	[3]92,155
Iron content do	67,654	74,576	63,609	61,750	57,850
Metal:					
Pig iron[6] do	12,038	12,960	11,022	11,054	[4]13,190
Ferroalloys, electric-furnace:					
Chromium metal	--	--	6	6	6
Ferroboron	26	27	--	--	--
Ferrocalcium silicon	6,639	8,025	7,481	9,657	9,500
Ferrochromium	84,514	93,443	118,780	96,646	[3]78,012
Ferrosilicochromium	7,239	8,086	8,655	2,598	[3]2,000
Ferrocolumbium	13,913	17,530	14,632	11,506	11,500
Ferromanganese	133,563	140,496	107,872	120,743	115,000
Ferromolybdenum	1,469	802	797	337	300
Ferronickel	11,355	11,280	10,744	10,597	[3]25,991
Ferrophosphorus	148	354	346	22	25
Ferrosilicon	[r]66,992	109,140	120,662	115,314	[3]161,709
Ferrosilicomagnesium	14,432	13,734	11,002	11,275	11,000
Ferrosilicozirconium	--	488	497	503	500
Ferrotitanium	795	698	498	430	450

See footnotes at end of table.

Table 1.—Brazil: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS —Continued					
Iron and steel —Continued					
Metal —Continued					
Ferroalloys, electric-furnace —Continued					
Ferrotungsten	396	217	95	74	75
Ferrovanadium	851	807	296	238	250
Inoculant	--	--	1,428	1,393	1,400
Silicomanganese	127,503	134,243	142,743	172,358	167,333
Silicon metal	[r]6,594	[r]13,302	18,957	17,921	[3]20,602
Total	[r]476,429	[r]552,672	565,491	571,618	605,653
Steel, crude, excluding castings thousand tons	13,893	15,339	13,230	12,999	[4]14,660
Semimanufactures, flat and nonflat do	11,918	13,307	11,346	11,642	[3]12,486
Lead:					
Mine output, metal content	27,927	27,849	28,440	18,000	NA
Metal:					
Primary	55,084	44,519	34,657	21,943	[3]20,581
Secondary	42,968	40,431	31,100	26,299	[3]28,939
Manganese ore and concentrate, marketable, gross weight[4]	2,259,331	2,281,450	2,042,144	[r] [e]2,341,000	2,100,000
Nickel:					
Mine output, metal content	2,964	[r]4,291	6,811	13,093	[3]10,741
Ferronickel, Ni content	2,463	2,504	2,340	4,808	4,000
Rare-earth metals: Monazite concentrate, gross weight	1,900	2,532	2,100	1,768	2,000
Silver[7] thousand troy ounces	1,065	737	765	750	750
Tin:					
Mine output, metal content	7,005	6,930	8,297	9,500	[3]12,975
Metal, smelter, primary	10,133	8,792	7,639	9,298	[3]12,741
Titanium concentrates, gross weight:					
Ilmenite	13,191	16,839	15,087	15,000	15,000
Rutile	439	428	127	200	200
Tungsten, mine output, metal content	933	876	1,248	[e]1,100	[3]1,000
Zinc:					
Concentrate and salable ore	344,389	[r]392,148	400,631	596,971	600,000
Mine output, metal content	[r]69,000	[r]67,000	71,000	71,000	[3]73,000
Metal, smelter:					
Primary	63,494	78,303	91,944	95,528	[3]99,913
Secondary	15,327	17,666	19,000	14,400	[3]11,045
Zirconium: Zircon concentrate, gross weight[8]	2,623	3,410	6,000	4,966	5,000
NONMETALS					
Asbestos:					
Crude ore	2,422,420	2,602,501	1,992,766	2,092,087	2,000,000
Fiber	138,457	[r]170,403	138,417	145,998	135,000
Barite:					
Crude	489,997	108,015	178,895	150,000	150,000
Beneficiated	73,014	62,085	98,804	80,000	80,000
Marketable product[4]	108,042	104,752	116,340	120,000	118,000
Calcite	16,922	41,842	30,912	35,000	35,000
Cement, hydraulic thousand tons	24,874	[r]27,193	26,051	25,644	[3]38,225
Clays:					
Bentonite	212,503	247,954	166,338	164,060	170,000
Kaolin:					
Crude	1,343,005	1,156,447	1,063,480	1,050,000	950,000
Beneficiated	349,446	410,197	469,757	493,100	460,000
Marketable product[4]	943,589	477,858	556,753	550,000	490,000
Other:					
Crude thousand tons	3,900	5,582	21,601	22,000	22,000
Beneficiated do	1,620	1,656	2,229	2,000	2,000
Diamond:[e]					
Gem thousand carats	236	253	163	[r]80	100
Industrial do	384	414	926	[r]450	450
Total[9] do	620	667	1,089	[r]530	550
Diatomite:					
Crude	[r]16,655	12,963	13,202	106,581	13,000
Beneficiated	6,650	10,807	8,858	13,131	13,000
Marketable product[4]	16,547	14,828	8,973	13,146	16,000
Feldspar and related materials:					
Feldspar, marketable product[4]	144,550	[r]123,263	118,407	131,853	150,000
Leucite, marketable product[4]	511	6,796	536	209	500
Sodalite, crude, marketable product	2,610	[r]561,875	[r] [e]859,125	[r] [e]400	500,000
Total	147,671	[r]691,934	[r] [e]978,068	132,462	650,500

See footnotes at end of table.

Table 1.—Brazil: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Fluorspar:					
Crude	163,179	86,347	174,665	201,971	190,000
Concentrates, marketable product:					
Acid-grade	26,852	32,729	36,226	38,051	36,000
Metallurgical-grade	25,547	22,640	17,403	20,490	17,200
Total	52,399	55,369	53,629	58,541	53,200
Graphite:					
Crude	135,977	234,883	464,089	359,991	375,000
Marketable product:					
Direct-shipping crude ore	85,130	6,000	16,318	6,131	NA
Concentrate	10,867	21,294	17,499	15,413	20,000
Total	95,997	27,294	33,817	21,544	NA
Gypsum and anhydrite, crude	464,730	605,824	695,290	680,800	700,000
Kyanite:					
Crude	8,193	18,296	18,150	18,000	18,000
Marketable product[4]	1,750	[r]4,270	1,590	423	1,000
Lime, hydrated and quicklime[e] thousand tons	4,720	4,810	5,000	5,000	5,000
Lithium mineral concentrates:					
Amblygonite	187	182	277	66	200
Lepidolite	58	51	2	74	50
Petalite	1,501	2,487	2,080	2,293	2,500
Spodumene	--	98	243	341	200
Total	1,746	2,818	2,602	2,774	2,950
Magnesite:					
Crude	[r]590,240	[r]788,365	618,251	505,385	450,000
Beneficiated	[r]265,671	315,851	285,792	225,533	200,000
Mica, all grades[10]	4,074	4,817	1,949	1,078	2,000
Nitrogen: N content of ammonia	265,500	351,600	375,700	503,200	[4]738,100
Phosphate rock including apatite:					
Crude:					
Mine product thousand tons	12,478	16,533	16,441	25,070	30,000
Of which, sold directly do	39	50	53	7,395	NA
Concentrate:					
Gross weight do	1,628	2,612	3,185	2,767	3,500
P_2O_5 content do	603	989	[r] [e]1,128	[r] [e]980	1,300
Pigments, mineral: Other, crude	7,532	6,465	4,153	5,272	6,000
Precious and semiprecious stones except diamond, crude and worked:[10]					
Agate kilograms	1,589,096	1,738,890	1,424,381	1,038,287	NA
Amethyst do	327,479	310,594	234,198	195,502	NA
Aquamarine do	1,499	6,739	3,807	24,479	NA
Cat's-eye do	3	--	30	NA	NA
Citrine do	60,658	62,971	52,094	29,760	NA
Emerald do	7,468	9,126	10,538	7,646	NA
Garnet do	837	54	2	16	NA
Opal do	1,382	2,169	103	46	NA
Ruby value	$2,275	--	--	NA	NA
Sapphire kilograms	(11)	--	--	NA	NA
Topaz do	15,729	7,189	4,011	3,631	NA
Tourmaline do	2,126	3,938	4,319	2,669	NA
Turquoise value	$337	NA	NA	NA	NA
Other kilograms	406,213	292,677	249,660	188,674	NA
Quartz crystal, all grades[10]	4,743	5,753	5,154	NA	NA
Salt:					
Marine thousand tons	2,866	3,042	2,766	2,888	3,000
Rock do	689	796	839	836	850
Silica (silex)	7,005	10,245	4,517	7,978	9,000
Sodium compounds:					
Caustic soda	645,143	691,000	759,000	760,000	750,000
Soda ash, manufactured (barilla)	118,659	176,000	188,000	199,000	190,000
Stone, sand and gravel:					
Dimension stone:					
Marble, rough-cut[12]	177,290	66,839	67,844	122,144	NA
Slate	34,957	7,679	19,464	4,411	NA
Crushed and broken stone:					
Basalt[13]	198,789	NA	NA	329,564	NA
Calcareous shells	1,002,692	1,244,464	1,212,252	1,328,960	NA
Dolomite thousand tons	1,712	1,354	1,961	1,954	NA
Gneiss[14] do	1,244	NA	NA	249,798	NA

See footnotes at end of table.

Table 1.—Brazil: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Stone, sand and gravel —Continued					
Crushed and broken stone —Continued					
Granite thousand cubic meters	42,684	47,032	49,225	43,720	NA
Limestone thousand tons	44,664	50,170	52,066	49,027	NA
Quartz[15]	57,920	133,068	144,707	67,527	NA
Quartzite:					
Crude	379,253	245,592	795,104	636,797	NA
Processed	50,358	139,282	122,700	NA	NA
Shale	587,428	NA	NA	NA	NA
Sand thousand cubic meters	17,959	22,014	35,876	40,088	NA
Sulfur:					
Frasch thousand tons	--	--	--	--	[3]1
Pyrites do	33	25	44	54	[3]55
Byproduct:					
Metallurgy do	--	--	17	30	[3]150
Petroleum do	92	131	102	100	[3]110
Total do	125	156	163	184	[3]316
Talc and related materials:					
Talc, marketable product[4]	310,397	338,450	325,191	328,644	NA
Pyrophyllite, marketable product[4]	55,081	74,606	178,464	76,624	NA
Other: Agalmatolite, marketable product	101,281	131,034	49,147	63,068	NA
Vermiculite:					
Crude	10,496	35,466	77,997	43,316	45,000
Marketable product[4]	7,382	12,181	14,307	14,059	15,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous, marketable[4] thousand tons	7,604	8,300	5,300	6,200	[3]6,700
Coke, metallurgical, all types do	3,930	4,049	5,700	NA	NA
Gas, natural:					
Gross million cubic feet	67,045	77,868	88,286	106,968	[3]141,700
Marketed do	[e]43,000	50,000	NA	NA	NA
Natural gas liquids thousand 42-gallon barrels	2,012	2,063	2,426	2,950	3,700
Petroleum:					
Crude do	62,444	68,496	77,895	94,738	[3]123,700
Refinery products:					
Gasoline do	84,780	68,301	71,100	74,539	[3]64,300
Jet fuel do	20,046	20,278	23,360	19,975	[3]17,600
Kerosine do	NA	4,095	NA	4,024	[3]4,500
Distillate fuel oil do	111,091	121,846	216,502	122,105	[3]113,900
Residual fuel oil do	113,179	105,392	NA	89,397	[3]80,300
Lubricants do	3,285	4,233	3,755	4,801	4,800
Other do	NA	69,692	NA	NA	NA
Refinery fuel and losses do	85,253	11,252	NA	NA	NA
Total do	[r]NA	405,089	NA	NA	NA

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through Oct. 7, 1984.

[2] In addition to the commodities listed, molybdenite, bismuth, and uranium oxide are produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

[4] Direct sales and beneficiated.

[5] Officially reported figures are as follows, in troy ounces: major mines: 1979—107,158; 1980—131,432; 1981—140,691; 1982—not available; and 1983—not available; garimpeiros: 1979—36,234; 1980—310,704; 1981—414,744; 1982—not available; and 1983—not available.

[6] Includes sponge iron as follows, in thousand metric tons: 1979—324; 1980—275; 1981—226; 1982—226 (estimated); and 1983—255 (estimated).

[7] Smelter and/or refined metal.

[8] Includes baddeleyite-caldasite.

[9] Figures represent officially reported output plus official Brazilian estimates of output by nonreporting miners; officially reported output was as follows, in thousand carats: 1979—83; 1980—158; 1981—136; 1982—not available; and 1983—not available.

[10] Exports.

[11] Less than 1/2 unit.

[12] Data on output in gravimetric units are not available for 1980 and later years, but output on a volumetric basis was reported as follows, in cubic meters: 1980—67,844; 1981—66,893; 1982—122,144; and 1983—not available.

[13] Data on output in gravimetric units are not available for 1980 and later years, but output on a volumetric basis was reported as follows, in cubic meters: 1980—483,617; 1981—438,391; 1982—329,564; and 1983—not available.

[14] Data on output in gravimetric units are not available for 1980 and later years, but output on a volumetric basis was reported as follows, in cubic meters: 1980—47,031,817; 1981—49,225,056; 1982—249,798; and 1983—not available.

[15] Apparently includes crude quartz used to produce quartz crystal (listed separately in this table) as well as additional quantities of common quartz.

TRADE

The estimated mineral trade balance for 1983, excluding petroleum, was a positive $1.7 billion, up from $1.4 billion in 1982. The leading exports by value were iron ore, bauxite, and manganese. Brazil exported 69 million tons of iron ore, valued at approximately $1.4 billion; 3.4 million tons of bauxite, valued at $99 million; and 1.8 million tons of beneficiated manganese ore, valued at $83 million. The total trade balance was a positive $6.5 billion.

Preliminary estimates show that 46% of the value of the primary mineral commodities, excluding petroleum and natural gas, was exported. Brazil, by yearend, reached a point where its imports of petroleum were 45% to 50% of its requirements. This was a marked improvement over those of previous years.

Table 2.—Brazil: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Unspecified	70	69	--	West Germany 20; Norway 20; Sweden 10.
Aluminum:				
Ore and concentrate thousand tons	4,126	2,991	446	Canada 1,413; West Germany 593.
Oxides and hydroxides	637	4,939	--	Mainly to Argentina.
Metal including alloys:				
Unwrought	2,159	3,676	--	Japan 3,004; Uruguay 530.
Semimanufactures	9,675	8,451	--	Japan 3,060; Chile 2,410; Argentina 1,606.
Chromium:				
Ore and concentrate	NA	240	--	Argentina 200; Chile 40.
Oxides and hydroxides	128	NA		
Copper:				
Matte and speiss including cement copper	800	700	--	All to Belgium-Luxembourg.
Metal including alloys:				
Unwrought	1	9	5	Bolivia 2; Netherlands 1; Paraguay 1.
Semimanufactures	11,282	10,016	6,815	Singapore 668; Ireland 356; Colombia 309.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite -- thousand tons	85,798	80,927	956	Japan 30,306; West Germany 14,468.
Metal:				
Pig iron, cast iron, related materials	715,084	901,731	170,861	Japan 158,128; Argentina 109,353.
Ferroalloys:				
Ferromanganese	36,490	26,435	21,000	Japan 3,500; Colombia 600.
Unspecified	223,578	196,030	38,514	Japan 122,313; Netherlands 17,093.
Steel, primary forms	136,536	224,131	20,518	Argentina 56,907; United Kingdom 15,501; Italy 14,972.
Semimanufactures:				
Bars, rods, angles, shapes, sections	636,593	627,422	181,168	Saudi Arabia 179,865; Iraq 85,125; Nigeria 45,209.
Universals, plates, sheets	768,557	1,301,758	276,895	Belgium-Luxembourg 173,445; Japan 120,522; Argentina 89,218.
Hoop and strip	9,124	14,128	244	West Germany 6,896; Chile 1,003.
Rails and accessories	12,745	1,884	--	Mainly to Iraq.
Wire	21,481	18,755	2,317	Nigeria 3,873; Colombia 2,812; Paraguay 1,321.
Tubes, pipes, fittings	283,024	172,383	81,945	Australia 11,735; Venezuela 11,540; Iraq 10,031.
Castings and forgings, rough	1,224	1,772	450	Belgium-Luxembourg 1,071.
Lead: Metal including alloys:				
Unwrought	419	1	--	All to Paraguay.
Semimanufactures	20	5	--	Mainly to Paraguay.
Manganese:				
Ore and concentrate thousand tons	1,018	990	192	Czechoslovakia 110; Argentina 107; Japan 106.
Oxides	1,983	3,045	--	Argentina 1,456; Colombia 770; Mexico 450.
Molybdenum: Metal including alloys, all forms value, thousands	$24	$12	--	Argentina $11; Venezuela $1.

See footnotes at end of table.

Table 2.—Brazil: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Nickel: Metal including alloys, semimanufactures	6	42	--	Argentina 28; Mexico 12.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, unspecified value, thousands	$499	$52	--	All to Argentina.
Silver: Metal including alloys, unwrought and partly wrought do	$15	$88	--	West Germany $29; Switzerland $27; Argentina $19.
Tin: Metal including alloys:				
Unwrought	4,747	4,346	2,422	Netherlands 908; Argentina 576.
Semimanufactures	187	63	--	Mainly to West Germany.
Titanium: Oxides value, thousands	$2	$4	--	All to Argentina.
Tungsten:				
Ore and concentrate	1,741	1,860	231	West Germany 709; Netherlands 656.
Metal including alloys, all forms	2	1	--	All to Mexico.
Uranium and/or thorium: Ore and concentrate	$13,228	NA		
Vanadium: Ore and concentrate[2]	293	167	138	Netherlands 18; Sweden 4.
Zinc:				
Oxides	18	--		
Blue powder	53	8	--	All to Argentina.
Metal including alloys:				
Unwrought	2,500	2,500	--	All to Belgium-Luxembourg.
Semimanufactures	7	18	--	Paraguay 12; Bolivia 5.
Other:				
Ores and concentrates	811	1,063	1,063	
Ashes and residues	704	436	69	Japan 360.
Base metals including alloys, all forms	28	19	14	Argentina 3; Nigeria 2.
NONMETALS				
Abrasives, n.e.s.:				
Artificial: Corundum	15,711	10,343	1,306	Argentina 3,540; Mexico 1,890; Japan 1,481.
Grinding and polishing wheels and stones	1,181	1,402	726	Australia 88; Guatemala 63; Philippines 52.
Asbestos, crude	464	7,022	9	Argentina 3,194; Mexico 1,196.
Barite and witherite	24,255	19,730	--	Venezuela 16,025; Trinidad and Tobago 3,700.
Cement	168,376	10,524	--	Paraguay 8,784; Bolivia 1,380.
Clays, crude	135,521	176,206	--	Belgium-Luxembourg 67,985; Japan 35,900.
Diamond:				
Gem, not set or strung value, thousands	$6,100	$2,000	$423	Switzerland $834; Belgium-Luxembourg $354.
Industrial do	$127	$1	--	All to Argentina.
Fertilizer materials:				
Crude, n.e.s	5	12	--	Paraguay 4; Colombia 2; Ecuador 2.
Manufactured:				
Ammonia	15,137	136	--	Uruguay 99; Paraguay 23; Bolivia 14.
Nitrogenous	592	2,010	--	Argentina 1,037; Paraguay 360; Uruguay 315.
Phosphatic	3,013	6,766	--	Argentina 3,715; Paraguay 2,951.
Potassic	569	195	--	Paraguay 120; Uruguay 40; Argentina 35.
Unspecified and mixed	10,021	23,827	--	Paraguay 11,581; Belgium-Luxembourg 5,217; Argentina 3,790.
Graphite, natural	7,439	5,396	3,619	Japan 1,015.
Gypsum and plaster	3,118	112	--	Mainly to Paraguay.
Lime	5,148	5,624	--	Do.
Magnesite	106,196	95,808	2,500	Poland 44,705; Japan 27,321.
Mica: Crude including splittings and waste	1,950	1,078	556	West Germany 318; United Kingdom 100.
Phosphates, crude	22	NA		
Pigments, mineral: Iron oxides and hydroxides, processed	2,123	404	17	Chile 187; Paraguay 61.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$59,490	$38,420	$15,227	Japan $11,382; West Germany $3,996; Switzerland $3,973.
Synthetic do	$16	$3	--	All to West Germany.
Salt and brine	141,861	186,180	109,124	Uruguay 52,501; Nigeria 14,700.

See footnotes at end of table.

Table 2.—Brazil: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Sodium compounds, n.e.s.:				
Carbonate, manufactured	NA	3,774	--	Mainly to Paraguay.
Sulfate, manufactured	NA	42	--	Paraguay 21; Argentina 10; Uruguay 9.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	92,025	75,917	688	Italy 53,948; Japan 13,097.
Worked	9,371	9,058	4,032	Japan 2,121; Paraguay 571.
Dolomite, chiefly refractory-grade	100	250	--	Argentina 150; Uruguay 100.
Gravel and crushed rock	142	13,525	--	Mainly to Bolivia.
Limestone other than dimension	505	1,060	--	Paraguay 988; Uruguay 62.
Quartz and quartzite	5,317	7,579	107	West Germany 5,023; Belgium-Luxembourg 1,033.
Sand other than metal-bearing	4,631	4,275	--	Peru 2,440; Argentina 1,752.
Sulfur:				
Elemental, crude including native and byproduct	11	20	--	All to Uruguay.
Sulfuric acid	363	161	--	Bolivia 151; Iraq 8.
Talc, steatite, soapstone, pyrophyllite	499	99	37	West Germany 30; Argentina 26.
Other:				
Crude	4,313	4,460	1,000	Netherlands 3,254.
Slag and dross, not metal-bearing	325	101	--	Mainly to Argentina.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,001	600	--	All to Tanzania.
Carbon: Carbon black	1,579	617	--	Mozambique 258; Uruguay 189; Chile 134.
Coal: All grades excluding briquets	--	560	--	All to Argentina.
Coke and semicoke	37	NA		
Petroleum:				
Crude thousand 42-gallon barrels	4,771	7,955	6,930	Bahamas 655.
Refinery products:				
Liquefied petroleum gas do	496	356	--	Paraguay 221; Suriname 135.
Gasoline do	8,924	9,612	4,252	Chile 1,019; Zaire 693; Mozambique 442.
Mineral jelly and wax do	200	199	97	Mexico 53; United Kingdom 9.
Kerosine and jet fuel do	4,172	4,786	319	Zaire 1,141; Indonesia 700; Netherlands 495.
Distillate fuel oil do	3,089	7,635	--	Zaire 1,896; Mozambique 1,025; Spain 885.
Lubricants do	374	682	133	Mexico 335; United Kingdom 86.
Nonlubricating oils do	3	79	35	Netherlands 18; Mexico 14.
Residual fuel oil do	7,908	9,573	7,561	Netherlands 1,294.
Bituminous mixtures do	8	6	--	Paraguay 4; Bolivia 1.

NA Not available.

[1] Table prepared by John G. Panulas.

[2] May contain molybdenum ore.

Table 3.—Brazil: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Unspecified	78	83	33	Japan 20; West Germany 12.
Aluminum:				
Ore and concentrate	14,971	8,598	8,538	United Kingdom 60.
Oxides and hydroxides	26,867	86,995	27,576	Netherlands 48,205; Jamaica 10,217.
Metal including alloys:				
Scrap	5,340	3,750	3,690	Canada 60.
Unwrought	28,241	10,766	327	Netherlands 2,332; Italy 1,867; United Kingdom 1,506.
Semimanufactures	7,605	2,783	1,313	West Germany 1,079; United Kingdom 102.

See footnotes at end of table.

Table 3.—Brazil: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Chromium:				
Ore and concentrate	21,966	4,381	--	All from Republic of South Africa.
Oxides and hydroxides	142	40	--	United Kingdom 18; Poland 1.
Cobalt: Oxides and hydroxides	16	21	20	United Kingdom 1.
Copper:				
Ore and concentrate	NA	10,544	--	All from Canada.
Metal including alloys:				
Scrap	1,483	1,437	1,167	Chile 270.
Unwrought	152,945	204,748	730	Chile 153,658; Peru 26,300.
Semimanufactures	2,185	1,803	295	West Germany 598; United Kingdom 377; Japan 299.
Iron and steel: Iron ore and concentrate excluding roasted pyrite	30	12	9	West Germany 2; Switzerland 1.
Metal:				
Scrap	6,828	7,186	4,385	Canada 2,800.
Pig iron, cast iron, related materials	81,309	60,113	3,034	Trinidad and Tobago 27,185; Bahamas 25,994.
Ferroalloys, unspecified	6,165	1,228	13	Republic of South Africa 809; Italy 173.
Steel, primary forms	391,368	214,019	2,535	Belgium-Luxembourg 79,633; Spain 60,580; Venezuela 38,999.
Semimanufactures:				
Bars, rods, angles, shapes, sections	61,198	26,049	200	West Germany 9,160; United Kingdom 7,970; Japan 4,159.
Universals, plates, sheets	312,991	122,451	9,592	France 46,052; Japan 26,580; West Germany 17,366.
Hoop and strip	7,339	4,339	1,111	West Germany 2,014; Sweden 400; France 369.
Rails and accessories	29,633	27,488	807	Japan 9,514; West Germany 3,863; Austria 3,808.
Wire	2,671	1,679	151	Italy 636; Japan 560; West Germany 119.
Tubes, pipes, fittings	93,902	24,172	2,144	Japan 6,964; Italy 3,808; Belgium-Luxembourg 3,454.
Castings and forgings, rough	230	225	6	West Germany 135; Italy 68.
Lead:				
Ore and concentrate	15,405	NA		
Oxides	192	335	6	Mexico 204; Belgium-Luxembourg 100.
Metal including alloys:				
Scrap	1,770	NA		
Unwrought	212	669	--	Mexico 562; Peru 100.
Semimanufactures	1	1	NA	NA.
Magnesium: Metal including alloys:				
Scrap	243	582	55	Republic of South Africa 292; Netherlands 147.
Unwrought	5,008	5,583	3,252	Norway 2,331.
Semimanufactures	9	3	1	Sweden 2.
Manganese:				
Ore and concentrate	15,293	11,324	--	Mexico 7,080; Gabon 3,000.
Oxides	4	13	5	Japan 5; Belgium-Luxembourg 3.
Mercury 76-pound flasks	2,698	3,655	174	Mexico 3,451.
Metalloids: Unspecified	6,921	6,963	6,625	United Kingdom 168; West Germany 96.
Molybdenum: Metal including alloys, all forms	44	42	23	West Germany 9; Netherlands 7; France 2.
Nickel:				
Matte and speiss	33	13	9	West Germany 3.
Metal including alloys:				
Scrap	10	50	50	
Unwrought	4,922	1,735	1,247	Norway 136; Netherlands 102.
Semimanufactures	468	556	97	Republic of South Africa 232; West Germany 114.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, unspecified value, thousands	$4,769	$2,014	$409	West Germany $627; Netherlands $617.
Silver: Metal including alloys, unwrought and partly wrought do	$23,748	$23,013	$1,131	Peru $13,313; Mexico $6,010.
Tin:				
Ore and concentrate	301	NA		
Metal including alloys:				
Unwrought value, thousands	$2	$25	$25	
Semimanufactures	11	15	--	United Kingdom 6; West Germany 5; Netherlands 3.

See footnotes at end of table.

Table 3.—Brazil: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Titanium: Oxides	5,763	1,843	43	West Germany 878; France 440; United Kingdom 211.
Tungsten:				
Ore and concentrate	2,241	1,303	42	Chile 1,260.
Metal including alloys, all forms	39	36	16	West Germany 10; Netherlands 4.
Vanadium: Ore and concentrate[2]	76,977	67,982	1,210	Australia 61,975; Republic of South Africa 4,571.
Zinc:				
Ore and concentrate	49,578	55,672	--	Peru 29,197; Canada 14,791; Mexico 11,684.
Oxides	347	494	12	Uruguay 220; Netherlands 215.
Blue powder	15	3	2	West Germany 1.
Metal including alloys:				
Unwrought	27,303	7,403	--	Peru 3,325; Mexico 3,166.
Semimanufactures	78	91	--	Belgium-Luxembourg 67; West Germany 23.
Other:				
Ores and concentrates	448	597	--	Bolivia 284; Thailand 253.
Ashes and residues	4,667	1,236	1,236	
Base metals including alloys, all forms	1,515	2,130	307	Republic of South Africa 825; West Germany 807; Netherlands 191.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1,184	NA		
Artificial: Corundum	249	248	217	France 15; Austria 9; West Germany 7.
Dust and powder of precious and semiprecious stones, excluding diamond value, thousands	$3,532	$2,744	$1,988	Ireland $401; West Germany $350.
Grinding and polishing wheels and stones	300	198	89	West Germany 54; Japan 29.
Asbestos, crude	13,020	13,193	457	Canada 10,231; Italy 1,735.
Barite and witherite	74	60	2	West Germany 50; Switzerland 8.
Boron materials:				
Crude natural borates	14,887	7,332	423	Argentina 2,189; Turkey 2,000; Peru 1,920.
Oxides and acids	6,424	4,082	441	Argentina 2,456; Turkey 780.
Cement	6,899	21,274	1,220	Argentina 11,630; Colombia 5,000; France 1,751.
Chalk	378	94	--	France 54; West Germany 40.
Clays, crude	19,746	11,914	7,949	Argentina 2,824; France 997.
Cryolite and chiolite	108	31	--	Denmark 30; West Germany 1.
Diamond:				
Gem, not set or strung value, thousands	$1,099	$1,598	$17	Israel $885; Belgium-Luxembourg $373; Switzerland $251.
Industrial do	$1,069	$808	$561	Ireland $215.
Diatomite and other infusorial earth	2,127	1,829	341	Mexico 935; West Germany 545.
Fertilizer materials:				
Crude, n.e.s	15	250,233	84,416	Israel 105,463; Morocco 44,774.
Manufactured:				
Ammonia	175,408	57,007	12,593	Mexico 44,412.
Nitrogenous thousand tons	964	881	496	West Germany 120; Netherlands 88.
Phosphatic	161,866	106,931	54,066	Uruguay 21,521; Portugal 16,000.
Potassic thousand tons	1,274	1,494	220	East Germany 679; Canada 210.
Unspecified and mixed	237,032	156,893	90,566	Chile 66,013.
Graphite, natural	57	42	--	Madagascar 35; West Germany 5.
Gypsum and plaster	1,002	801	1	Bolivia 800.
Lime	51	40	--	All from Belgium-Luxembourg.
Magnesite	849	1,447	808	Republic of South Africa 276; West Germany 220.
Mica:				
Crude including splittings and waste	170	76	--	Canada 68; Norway 5; United Kingdom 3.
Worked including agglomerated splittings	144	61	12	Switzerland 20; Belgium-Luxembourg 9; West Germany 8.
Nitrates, crude	14,350	15,580	--	All from Chile.
Phosphates, crude	466,309	234,643	84,416	Israel 105,453; Morocco 44,774.
Pigments, mineral: Iron oxides and hydroxides, processed	1,619	1,531	126	West Germany 1,388.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$117	$309	$291	Switzerland $18.
Synthetic do	$129	$32	$7	Switzerland $25.

See footnotes at end of table.

Table 3.—Brazil: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Pyrite, unroasted	195	90	18	West Germany 72.
Salt and brine	4	9	6	United Kingdom 2.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	118,403	117,655	66,668	France 24,409; West Germany 19,660.
Sulfate, manufactured	NA	106,576	3,594	Mexico 71,987; Chile 25,166.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	142	7	--	All from West Germany.
Worked	19	6		All from Portugal.
Dolomite, chiefly refractory-grade	4,671	2,280	--	Italy 2,260.
Gravel and crushed rock	144	209	--	France 140; Italy 60; West Germany 9.
Quartz and quartzite	8	14	10	West Germany 4.
Sand other than metal-bearing	19,185	510	35	Argentina 448.
Sulfur:				
Elemental, crude including native and byproduct	817,072	882,540	79,528	Canada 498,283; Poland 256,150.
Sulfuric acid	113,938	97,256	5	Norway 40,208; West Germany 25,599; Spain 25,471.
Talc, steatite, soapstone, pyrophyllite	86	35	21	Norway 14.
Other:				
Crude	11,177	6,372	1,850	Argentina 2,438; Australia 1,198.
Slag and dross, not metal-bearing	2,862	14,092	--	Republic of South Africa 13,327.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	322	405	335	Argentina 70.
Coal: All grades including briquets thousand tons	4,557	4,361	2,780	Poland 1,121.
Coke and semicoke	283,485	126,044	23,552	West Germany 33,950; Japan 22,965; Netherlands 21,977.
Petroleum:				
Crude thousand 42-gallon barrels	309,465	290,888	--	Iraq 72,579; Qatar 8,907.
Refinery products:				
Liquefied petroleum gas do	1,574	7,726	441	Saudi Arabia 5,770; Indonesia 513; Bolivia 444.
Gasoline do	591	783	94	Netherlands Antilles 354; Italy 166.
Distillate fuel oil do	[r]5,932	1,795	1,680	Mexico 12.
Lubricants do	[r]419	298	68	Romania 193; Netherlands Antilles 34.
Nonlubricating oils do	[r]86	82	--	All from Romania.
Residual fuel oil do	[r]1,739	10,859	2,250	Kuwait 2,182; Venezuela 1,710; Netherlands Antilles 1,683.
Petroleum coke do	323	385	64	Argentina 292; Japan 28.

[r] Revised. NA Not available.

[1] Table prepared by John G. Panulas.

[2] May include molybdenum ore and concentrate.

COMMODITY REVIEW

METALS

Alumina, Aluminum, and Bauxite.—Domestic sales of bauxite totaled $2 million. This comprised a very small portion of the total value of $101 million for the bauxite produced. The average price per ton of bauxite was $31. Mineração Rio do Norte S.A. signed a contract to supply Alumínio do Maranhão S.A. (ALUMAR) with 11.2 million tons of wet bauxite over a 10-year period for $300 million. As of January 1, 1983, crude bauxite reserves were estimated to be 4.6 billion tons.

In 1983, the domestic surplus of aluminum was 174,500 tons, of which 161,000 tons was exported. A surplus of 191,000 tons and exports of 181,000 tons of aluminum are forecast for 1984.

Alcoa Alumínio do Brasil S.A. was expected to conclude negotiations in February 1984 that would give Construcoes e Comercio Camargo Correa S.A., a large Brazilian construction company, a 36% interest in the Brazilian subsidiary of the Aluminum Co. of America. Camargo Correa's payment, $230 million, would be used to double the alumina and aluminum smelter capacity at the ALUMAR complex located in northwestern Brazil near the city of São Luis.

The enlarged capacity of ALUMAR, which is to begin operation in July 1984, is 1 million tons of alumina and 200,000 tons of aluminum. After February 1984, ALUMAR will be jointly owned by Billiton Metais, 40%; Camargo Correa, 36%; and Alcoa Alumínio, 24%.

Alumínio do Brasil Nordeste, a subsidiary of Alcan Alumínio do Brasil, invested $200 million in expanding its Orotu, Bahia, plant from 28,000 to 118,000 tons per year of aluminum, about one-third of domestic consumption. Alcan Alumínio expects 1984 export sales to reach $100 million, up 40% from that of 1983. Valesul Alumínio S.A. produced 83,125 tons of aluminum in 1983, with sales amounting to $18 million. Exports totaled 44,000 tons.

Columbium.—Cia. Brasileira de Metalurgia e Mineração (CBMM), owned by Moreira Salles (53%) and Molycorp Inc. of the United States (47%), is the largest producer of ferrocolumbium in Brazil. In 1983, CBMM exported 6,680 tons of ferrocolumbium and 280 tons of columbium oxide. The second largest ferrocolumbium producer was Catalão de Goiás with a capacity of 2,000 tons per year.

Copper.—Caraíba Metais S.A. Indústria e Cómercio, the Government-owned company that is the only producer of primary copper in Brazil, has the capacity to produce 150,000 tons per year. In 1983, estimated production was 84,000 tons. The projected output for 1984 is 111,000 tons. The $1.3 billion Caraíba project has estimated copper reserves of 13 million tons of contained copper at its Jaguarari Mine in the State of Bahia.

Banco Nacional do Desenvolvimento Econômico e Social and CVRD reached an agreement to invest $30 million through 1985 on the Sabobo (Carajás) Mine. The mine is scheduled to begin operation in 1985 and is planned to produce 250,000 tons of 40% copper concentrate per year.

Gold.—The major gold producer was the well-publicized Serra Pelada open pit mine where an estimated 40,000 private miners (garimpeiros) produced about 400,000 troy ounces from small (2 by 6 meters) claims using primitive hand methods to carry the ore and waste out of the surface mine. Government attempts, in late 1983, to convert the primitive mining operation to a mechanized mine by a private company were unsuccessful owing to strong objections by the thousands of private miners.

The country's total gold reserves are currently estimated at about 1 billion troy ounces, but this will doubtless increase in the future owing to more organized exploration activities by mining companies rather than garimpeiros. The regional reserve breakdown is, in troy ounces: north, 450 million (44.2%); central-west, 445 million (43.7%); northeast, 74 million (7.3%); southeast, 38 million (3.7%); and south, 11 million (1.1%).

A gold consulting firm has noted that from 1980 through 1983 Brazilian gold production was 3,318,000 troy ounces. Accordingly, gold production during this period could have been an additional 4,546,000 troy ounces if the gold miners had the capability to winnow microfine gold. This resulted in a financial loss during this period estimated at $18.9 billion.

Iron Ore.—Iron ore production decreased 3% in 1983, from 95 million tons in 1982 to 92 million tons.

CVRD's Timbopeba Mine in the State of Minas Gerais is to come on-stream in April 1984. The mine has iron ore reserves of 385 million tons grading 68% iron and is low in phosphorus and silica. CVRD's Capanema Mine in Minas Gerais State, operated by a consortium, Minas da Serra Geral S.A. (51% CVRD and 49% Kawasaki Steel Corp. of Japan), has the capacity to produce 11.5 million tons of iron ore per year, but only produced 6 million tons in 1983. The mine has reserves of 356 million tons.

Brazil exported approximately 70 million tons of iron ore valued at $1.4 billion. The total amount exported was comprised of 15.4 million tons of pellets ($398 million), 46 million tons of fines ($834 million), and 8.8 million tons of lump ore ($171 million).

Malaysia signed a contract with CVRD for $40 million to purchase 1.5 million tons of iron ore pellets over a 5-year period. CVRD filed a $67 million lawsuit against Kaiser Steel Corp., charging that the U.S. company failed to fulfill a long-term iron ore sales contract signed in 1979. CVRD reduced prices 11.4% on shipments of 24.5 million tons of iron ore to Japan in 1983.

As of January 1, Brazil's proven iron ore reserves were placed at approximately 17 billion tons (66% iron). The total potential iron ore reserves rose to 32 billion tons when ore grading less than 54% was considered.

Manganese.—Estimated production of beneficiated manganese ore was approximately 2 million tons containing about 800,000 tons of manganese metal. Of the total amount, Indústria e Comércio de Minérios S.A. (ICOMI) produced 1.4 million tons of beneficiated manganese ore containing 561,000 tons of manganese metal. ICOMI marketed 880,000 tons of beneficiated manganese ore, down 2% from that of 1982.

Production of manganese ferroalloys decreased slightly from the record high figures of 1982 to a total of 282,333 tons of ferromanganese and silicomanganese combined.

The Miguel Congo Mine near Ouro Preto, Minas Gerais State, has measured reserves of 8.3 million tons of manganese ore with the potential to produce 274,000 tons of ferromanganese per year. At yearend 1983, Brazil's total proven reserves of manganese ore were 208 million tons.

Nickel.—Nickel mine production decreased from 13,093 tons in 1982 to 10,741 tons. This resulted from the coming on-stream of the two lateritic nickel mines at Niquelandia, Goiás State. The Empresa de Desenvolvimento de Recursos Minerais S.A. operation at full capacity will produce 5,900 tons per year of ferronickel. Cia. Níquel Tocantins mines nickel carbonate at Niquelandia that is subsequently refined to electrolytic nickel at São Miguel Paulista in São Paulo. Nominal capacity of the Tocantins plant is 10,000 tons per year.

There are a number of low-grade lateritic nickel deposits, including several in the Grande Carajás region; however, given the reduction in internal demand and the recent alltime low in international prices, development of any of these deposits in the near future is unlikely. At yearend 1983, the proven reserves of nickel were reported to be approximately 5.5 million tons.

Tin.—Brazil is fast becoming a substantial tin producer. In 1983, Brazil ranked fifth with production of approximately 13,000 tons, an increase of 37% over the figure for 1982. Forecast production for 1984 is 16,000 tons. The three major companies that dominate production are Paranapanema S.A. Mineração, Indústria e Construção, Empresas Brumadinhos S.A., and Brascan Recursos Naturais S.A. Paranapanema is the largest and was responsible for the surge in production for 1983. Tin reserves are estimated to be approximately 500,000 tons but will very likely increase substantially in the future.

Titanium.—Rutilo e Ilmenite do Brasil S.A. began mining ilmenite and zirconite at Mataraca, State of Pernambuco, in 1983. The plant has the capacity to produce 102,000 tons per year of ilmenite (54% titanium dioxide) and 15,000 tons per year of zirconite (66% zirconium dioxide).

In 1987, CVRD will put into operation a titanium oxide plant at Tapira, Minas Gerais State. The plant will utilize ore from the Tapira and Salitre deposits containing about 350 million tons of ore, which corresponds to about 80 million tons of contained titanium. Titanium reserves in Minas Gerais and southern Goiás States total approximately 1 billion tons, composed almost entirely of anatase, grading between 20% and 25% titanium. Brazil has about 60% of the world's titanium reserves. CVRD has patented a plant to handle anatase concentrate. Each plant will cost about $250 million and would produce between 50,000 and 60,000 tons of titanium oxide, which would lead to export sales of about $80 million per year per unit.

Zinc.—Cia. Mineira de Metais S.A. (CMM) is Brazil's major zinc producer. The operation includes the Vazante Mine and Tres Marias smelter-refinery located in Minas Gerais State. The measured reserves at Vazante are comprised of 2 million tons of contained zinc in oxide and sulfide ore. The capacity of the CMM operation is 63,000 tons per year. Cia. Paraibuna de Metais operates a 30,000-ton-per-year smelter at Juiz da Fora using imported concentrates. The facility was closed for a short time in 1983 owing to a tailings dam failure. Brazil has measured contained zinc reserves of 2.7 million tons.

NONMETALS

Diamond.—Brazil produced an estimated 550,000 carats in 1983. Approximately 82% of the total production was of industrial quality with the remainder of gem quality. Extratifera de Diamantes Brasil S.A. is investing $6.9 million in a diamond and gem property at Romaria, Minas Gerais State. When fully operational, the mine will produce 72,000 carats per year consisting of 76% gem quality and 24% industrial quality.

Phosphate Rock.—In 1983, the industry operated at 84% of capacity. Domestic consumption for the year was approximately 3.3 million tons. Phosphoric acid production increased from 480,000 tons to 575,000 tons. Under construction is a plant that will produce 620,000 tons of phosphate concentrate per year. The total cost of the plant is estimated at $140 million, and it will provide 15% of Brazil's domestic requirements when completed.

Potassium.—Petrobrás Mineração S.A. (PETROMISA) at Nova Olinda do Norte, State of Amazonas, delineated a sylvanite deposit with a reserve base of 560 million tons. This is equivalent to 157 million tons of potassium chloride. The project cost $600 million, and annual production is expected to be 1.5 million tons of potassium chloride. PETROMISA plans to begin operations at its Taquari-Vassouras project in Sergipe in late 1984. The planned production capacity is 600,000 tons of potassium chloride per year.

MINERAL FUELS

Coal.—Brazil's coal production for 1983 was 6.7 million tons. Steam coal made up 83% of the total, with metallurgical coal comprising the remainder. At yearend, Brazil's known coal reserves were placed at 22.5 billion tons, which equates to 10 billion barrels of petroleum. Over 80% of the coal reserves are located in the State of Rio Grande do Sul. The known coal reserves comprise 82% of the fossil fuel reserves of Brazil. Projects planned to come on-stream in 1985 and 1986 will add another 6.5 million tons of coal production annually.

Natural Gas.—Brazil increased its natural gas production approximately 32% in 1983 over the figure for 1982. Petróleo Brasileiro S.A. (PETROBRÁS), the state petroleum company, stated that its primary efforts are to reduce flaring and boost the use of natural gas as a petrochemical feedstock, boiler fuel, and motor fuel. PETROBRÁS is experimenting with the use of compressed natural gas as a motor fuel for public transit buses.

In an effort to step up natural gas development to cut dependence on imported oil, PETROBRÁS began construction of Brazil's longest gas pipeline by yearend. The 254-mile pipeline, named "Nordestão," will link the Ubarana and Ogulha offshore natural gas fields off the State of Rio Grande do Norte in northeastern Brazil with Recife in the State of Pernambuco.

Brazil has planned to proceed with a feasibility study of the proposed 3,500-kilometer natural gas pipeline from Jurua, in the State of Amazonas, to São Paulo. PETROBRÁS announced that the Jurua natural gas basin contains an estimated 3 trillion cubic feet of natural gas, of which approximately 400 billion cubic feet is proven reserves. The estimated total cost of the project would range between $3 billion and $5 billion.

The Ministry of Mines and Energy for the State of Rio Grande do Sul received a proposal from The Fluor Corp. of the United States, in a joint venture with Joako Poyri Engenharia of São Paulo, for a $350 million coal gasification plant for the city of Porto Alegre. The proposal included U.S. credits for services and equipment.

Petroleum.—In 1983, Brazil's average daily production of petroleum was 339,000 barrels, up 30% from the figure for 1982. Offshore production accounted for 61% of the petroleum produced. The State of Bahia was the largest onshore producer while the State of Rio de Janeiro led in offshore production. PETROBRÁS stated that it plans to reach the 500,000-barrel-per-day figure about midyear 1984. Five oil companies from the United States joined in the search for oil in Brazil in 1983 but with little success. The companies were Exxon Corp., Occidental Petroleum Corp., Marathon Oil Co., Union Oil Co. of California, and Standard Oil Co. of California.

Short strikes occurred during July at the Replan refinery at Paulinia, São Paulo State, and the Landulfo refinery at Mataripe, Bahia State. The strikes prevented production of 1.8 million barrels of petroleum products; in addition, the Government was forced to seek financing for spot market purchases.

PETROBRÁS announced at yearend that Brazil's petroleum reserves had reached 1.8 billion barrels. The natural gas reserves were determined to be 900 billion cubic feet.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Brazilian cruzeiros (Cr$) to U.S. dollars at the rate of Cr$946.14=US$1.00 as of Dec. 31, 1983.

The Mineral Industry of Bulgaria

By Tatiana Karpinsky[1]

In 1983, Bulgaria was an important producer of copper, lead, zinc, and lower rank lignite. Mineral industry production continued at about the same level of output as in 1982, in accordance with the State Economic Plan. Major minerals projects underway included the expanded Troyanovo-North and Troyanovo-South lignite mines, an ammonium production section at the Stara Zagora chemical plant, an expansion of the thermoelectric power station in Ruse, and a renovated and expanded section of the Kremikovtsi steel plant. Renovation of the superphosphate and ammonia plants at the Dimitrovgrad chemical works was behind schedule.

Attention was turned to improving the New Economic Mechanism (NEM), introduced to the economy in 1982. The NEM was intended to foster controlled decentralization of economic management. Ministerial organizational changes were directed at rationalizing major industrial sectors, and under these changes, the Ministry of Energy and Power Supply and the Ministry of Metallurgy and Mineral Resources were combined.

The total population in Bulgaria was 8.9 million at yearend 1983. The number of industrial workers and employees in state enterprises, which included all large organizations and heavy industry, was 1.3 million in 1982. The number of workers and employees in mineral and energy enterprises, by branch, was as follows:

Branch	Workers and employees (thousands)
Engineering and metal industries	236.0
Coal industry	46.5
Ferrous metallurgy (including ore mining).	35.2
Production of electric power and steam	27.8
Total	345.5

Source: Statischeski Godishnik na Norodue Republica B'lgariya 1983 (Statistical Yearbook of the People's Republic of Bulgaria 1983), p. 167.

Government Policies and Programs.—The 1984 annual economic plan was approved by the National Assembly in September 1983. The national income was to increase by 3.8% and industrial output by 5%, the volume of capital investment was to reach 8.2 billion leva (L),[2] and foreign trade was to increase by 8.1%.

The main task for the iron and steel sector was to increase the output of high-quality steel and alloys. The nonferrous metals sector was to explore for domestic resources of cobalt, lead, nickel, palladium, tellurium, and zinc, using new techniques. Nonmetallic materials such as kaolin and quartz were also to be developed. The plan placed special emphasis on exploration for coal in the Dobrudja coal basin. A contract with the U.S.S.R. for building a 4,000-megawatt nuclear powerplant at Beline was being readied.

PRODUCTION

The Ministry of Metallurgy and Mineral Resources reportedly fulfilled the 1983 economic plan for its sector, and total mineral and metal production increased by 3.4%. In comparison with 1982 figures, production slightly increased in the steel, cement, nitrogen fertilizers, coal, and power industries. Nonferrous metal production also increased. Output of steel rolled products, phosphoric fertilizers, and soda ash decreased.

Bulgaria is pressing development of atomic energy. In 1974, the first 440-megawatt reactor of the Kozloduy atomic plant was put into operation. By 1983, four reactors were operating at the plant with a total capacity of 1,760 megawatts, which made up about 25% of the country's total energy production.

The heavy economic dependence on the Soviet Union is illustrated by the fact that industrial enterprises built with Soviet financial aid and technical assistance in 1982 accounted for close to 100% of the output of coke, copper, pig iron, pipe, and zinc; 98% of rolled steel; and 85% of lead.

Table 1.—Bulgaria: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Cadmium metal, smelter[e]	210	210	210	210	210
Copper:					
Mine output, metal content	[r]60,000	[r]62,000	62,000	70,000	70,000
Metal, primary and secondary:					
Smelter	[r]58,000	[r]59,000	62,000	70,000	70,000
Refined	62,000	63,000	62,000	65,000	65,000
Iron and steel:					
Iron ore:					
Gross weight thousand tons	2,103	1,886	1,754	1,552	1,500
Fe content do.	651	590	537	474	450
Iron concentrates do.	960	[r]896	797	732	700
Metal:					
Pig iron do.	1,450	1,527	1,512	1,558	1,500
Ferroalloys, electric furnace, all types do.	45	45	55	55	55
Steel, crude do.	2,482	2,567	2,483	2,584	[3]2,825
Semimanufactures, rolled do.	3,128	3,213	3,351	3,253	[3]3,235
Lead:					
Mine output, metal content	116,000	116,000	116,000	96,000	96,000
Metal, smelter, primary and secondary	[r]119,000	[r]119,000	119,000	[e]123,000	123,000
Manganese ore:					
Gross weight	42,000	49,000	45,321	45,000	45,000
Mn content	12,300	14,200	13,207	13,207	13,200
Molybdenum, mine output, metal content[e]	150	150	150	150	150
Silver, mine output, metal content[e] thousand troy ounces	920	930	930	930	930
Zinc:					
Mine output, metal content	75,000	70,000	[e]65,000	66,000	65,000
Metal, smelter, primary and secondary	89,000	90,000	90,000	90,000	90,000
NONMETALS					
Asbestos	600	700	400	600	600
Cement, hydraulic thousand tons	5,401	[r]5,359	5,433	5,614	[3]5,644
Clays: Kaolin	202,000	208,000	221,422	237,000	240,000
Gypsum and anhydrite:					
Crude thousand tons	309	311	350	376	370
Calcined	80	88	94	104	100
Lime: Quicklime thousand tons	1,868	[r]1,848	1,758	1,776	1,700
Nitrogen: N content of ammonia	[r]779,744	[r]827,216	838,764	826,106	[3]831,000
Pyrites, gross weight[e]	715,000	680,000	680,000	680,000	680,000
Salt, all types	86,000	87,000	[e]87,000	[e]87,000	87,000
Sodium carbonate, calcined thousand tons	1,498	1,479	1,469	1,459	[3]1,459
Sulfur:[e]					
S content of pyrites	315,000	300,000	300,000	300,000	300,000
Byproduct, all sources	75,000	70,000	70,000	70,000	70,000
Total	390,000	370,000	370,000	370,000	370,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, marketable:					
Anthracite thousand tons	104	97	89	80	80
Bituminous do.	170	170	157	161	160
Brown do.	5,855	5,793	5,657	5,537	6,700
Lignite do.	22,100	24,153	23,338	26,437	26,860
Total do.	28,229	30,213	29,241	32,215	[3]33,800
Coke do.	1,351	1,348	1,381	1,274	1,300
Gas, natural, marketed million cubic feet	4,820	6,714	4,840	[e]4,840	4,800

See footnotes at end of table.

Table 1.—Bulgaria: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum:					
Crude:					
As reported[e] thousand tons	180	180	180	180	180
Converted[e] thousand 42-gallon barrels	1,314	1,314	1,314	1,314	1,314
Refinery products do.	85,882	84,448	86,990	NA	NA

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through July 10, 1984.

[2] In addition to the commodities listed, bismuth, chromite, gold palladium, platinum, tellurium, uranium, barite, fluorspar, magnesite, and a variety of crude construction materials (common clays, sand and gravel, dimension stone, and crushed stone) are produced, but available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

TRADE

In the first 4 months of 1983, exports of fuels, mineral raw materials, and metals contributed 11% of total exports valued at L11.8 billion. Fuels, mineral raw materials, and metals accounted for 46% of total imports, valued also at L11.8 billion. The centrally planned economy countries accounted for 85% of total fuel, mineral, and metal imports and 26% of exports of this group of commodities.

In 1983, Bulgaria imported 5.4 million tons of bituminous coal, 2.3 million tons of iron ore, 507,000 tons of coke, 407,000 tons of pig iron, 179,000 tons of special steel, and 148,000 tons of iron concentrates, mostly from the U.S.S.R. The trade protocol between the U.S.S.R. and Bulgaria for 1984 continued the provisions of the 1981-85 trade agreement. In 1984, the Soviet Union was to export to Bulgaria iron ore, ferrous and nonferrous metals, coal, natural gas, crude oil, and electrical energy.

In exchange for Bulgarian participation in major Soviet development projects, Bulgaria will annually obtain, up to the year 2000, and apart from regular trade agreements, 40,000 tons of asbestos, over 1 million tons of iron concentrate (metal content), and 2,800 million cubic meters of natural gas.

Table 2.—Bulgaria: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Unwrought	3,600	3,594	--	Japan 3,574.
Semimanufactures	14	625	--	Jordan 614.
Cadmium: Metal including alloys, all forms	20	35	--	All to West Germany.
Copper: Metal including alloys:				
Scrap	734	216	--	All to Switzerland.
Unwrought	303	71	--	All to West Germany.
Semimanufactures	117	106	--	Yugoslavia 44; West Germany 32.
Iron and steel: Metal:				
Scrap	85,000	57,000	--	Yugoslavia 43,622.
Pig iron, cast iron, related materials	[2]33,500	9,622	--	Yugoslavia 8,850.
Ferroalloys:				
Ferrochromium	4,489	2,216	--	Austria 1,131; Sweden 606.
Ferromanganese	--	8,000	--	NA.
Ferrosilicon	5,999	6,622	--	West Germany 4,740; Austria 1,052.
Unspecified	21,000	11,160	--	Poland 7,707; Austria 2,183.
Steel, primary forms	224,094	242,168	--	West Germany 40,124; Italy 32,022.
Semimanufactures	907,913	689,025	--	NA.
Lead:				
Oxides	1,548	255	--	All to Yugoslavia.
Metal including alloys, all forms	3,955	[3]4,400	--	NA.

See footnotes at end of table.

Table 2.—Bulgaria: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982p	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Manganese: Ore and concentrate, metallurgical-grade	[2]5,500	10,000	--	All to Czechoslovakia.
Molybdenum: Ore and concentrate	249	291	--	All to West Germany.
Nickel: Metal including alloys, all forms	25	7	--	Netherlands 4.
Silver:				
Waste and sweepings[4] value, thousands	$267	$461	--	Switzerland $280; Belgium-Luxembourg $181.
Metal including alloys, unwrought and partly wrought do.	$789	$445	--	Italy $332; Netherlands $91.
Zinc: Metal including alloys, unwrought	10,593	14,323	--	Czechoslovakia 6,000; United Kingdom 1,998.[3]
NONMETALS				
Cement[5]	474,200	473,600	--	Switzerland 86,600; Yugoslavia 85,600.
Clays, crude	9,922	6,343	--	Hungary 6,130.
Diamond: Industrial value, thousands	$4,160	$3,779	--	All to Belgium-Luxembourg.
Fertilizer materials: Manufactured, nitrogenous[5]	505,605	539,987	--	Syria 60,900; undetermined 379,463.
Precious and semiprecious stones other than diamond: Synthetic value, thousands	$304	$466	--	All to West Germany.
Sodium compounds, n.e.s.: Carbonate, manufactured[5] thousand tons	1,095	1,120	--	U.S.S.R. 432; Hungary 108.
Stone, sand and gravel: Dimension stone:				
Crude and partly worked	7,526	8,578	--	Hungary 6,024; Italy 2,159.
Worked	1,165	3,055	--	West Germany 3,033.
Sulfur: Elemental: Crude including native and byproduct	--	13,413	--	All to France.
MINERAL FUELS AND RELATED MATERIALS				
Coal: Anthracite and bituminous	[2]13,300	65,654	--	Belgium-Luxembourg 52,235; Yugoslavia 13,419.
Petroleum refinery products thousand 42-gallon barrels	9,281	6,364	--	France 1,657; Italy 1,627.

pPreliminary. NA Not available.

[1] Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Bulgaria, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2] Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

[3] World Metal Statistics, World Bureau of Metal Statistics, London, United Kingdom.

[4] May include other precious metals.

[5] Official Trade Statistics of Bulgaria.

Table 3.—Bulgaria: Apparent imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982p	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	1,957	247	--	Italy 150; France 88.
Metal including alloys:				
Unwrought	15,712	6,993	--	Hungary 3,424; Yugoslavia 2,550.
Semimanufactures	8,162	5,721	--	West Germany 2,070; Hungary 1,262.
Bismuth: Metal including alloys, all forms	--	8	--	All from West Germany.
Chromium: Oxides and hydroxides	554	202	--	Poland 200.
Cobalt: Metal including alloys, all forms	2	11	--	Finland 10.
Copper:				
Sulfate[2]	8,454	7,712	--	All from U.S.S.R.
Metal including alloys:				
Unwrought	900	1,992	--	Belgium-Luxembourg 1,519.
Semimanufactures	2,376	2,495	--	West Germany 1,795; Austria 227.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite[2] thousand tons	2,280	2,360	--	U.S.S.R. 2,265.
Metal:				
Scrap	--	2,220	--	All from United Kingdom.
Pig iron, cast iron, related materials[2]	434,601	399,488	--	All from U.S.S.R.

See footnotes at end of table.

Table 3.—Bulgaria: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982^{p}	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Ferroalloys:				
Ferromanganese	1,140	980	--	France 510; West Germany 470.
Silicon metal	1,762	200	--	All from Norway.
Unspecified	21,042	20,000	--	NA.
Steel, primary forms thousand tons	708	675	--	France 18; undetermined 636.
Semimanufactures do	845	770	(3)	U.S.S.R. 194; undetermined 249.
Lead: Ore and concentrate	45,710	2,000	--	All from Italy.
Magnesium: Metal including alloys, all forms	[4]144	42	--	Yugoslavia 40.
Manganese: Ore and concentrate, metallurgical-grade thousand tons	[5]114	82	--	U.S.S.R. 77.
Molybdenum: Ore and concentrate	140	152	--	All from West Germany.
Nickel: Metal including alloys, all forms	114	85	--	West Germany 65; France 14.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$2,400	$1,198	--	West Germany $447; France $391.
Silver: Metal including alloys, unwrought and partly wrought do	$735	$204	--	West Germany $95; Switzerland $52.
Titanium:				
Ore and concentrate	3,270	3,588	--	Netherlands 2,768; West Germany 820.
Oxides	1,722	258	--	West Germany 254.
Metal including alloys, all forms	10	17	--	All from West Germany.
Tungsten: Metal including alloys, all forms	40	6	(3)	Japan 3; West Germany 2.
Zinc: Ore and concentrate	52,450	29,959	14,134	Peru 14,644.
Zirconium: Ore and concentrate	1,261	1,718	--	West Germany 1,520; Italy 198.
NONMETALS				
Abrasives, n.e.s.:				
Artificial:				
Corundum	1,737	2,512	--	Hungary 882; Italy 872.
Silicon carbide	--	1,657	--	All from Italy.
Grinding and polishing wheels and stones	[6]2,326	1,178	--	Italy 541; Yugoslavia 245.
Cement	[5]99,500	88,855	--	U.S.S.R. 70,000; Czechoslovakia 18,000.
Diamond:				
Gem, not set or strung thousand tons	--	$66	$14	Belgium-Luxembourg $52.
Industrial do	$7,015	$9,780	--	Belgium-Luxembourg $8,923.
Diatomite and other infusorial earth	224	395	--	France 273; West Germany 122.
Feldspar, fluorspar, related materials	200	262	--	All from West Germany.
Fertilizer materials: Manufactured:				
Phosphatic	500,064	245,328	85,677	U.S.S.R. 159,618.
Potassic, K_2O content	[5]118,000	122,558	--	U.S.S.R. 122,550.
Graphite, natural	240	513	--	West Germany 413; Austria 100.
Magnesium compounds	17,218	7,305	--	Czechoslovakia 7,000.
Mica:				
Crude including splittings and waste	20	15	--	All from West Germany.
Worked including agglomerated splittings	5	8	--	West Germany 6.
Pigments, mineral: Iron oxides and hydroxides, processed	222	315	--	West Germany 312.
Pyrite, unroasted	295,586	257,000	--	All from U.S.S.R.
Salt and brine	42,965	2,429	--	West Germany 2,386.
Sodium compounds, n.e.s.: Sulfate, manufactured	2,704	1,000	--	All from West Germany.
Sulfur:				
Elemental: Crude including native and byproduct	76,887	73,927	10,927	Poland 63,000.
Sulfuric acid	2,424	3,005	2	Poland 2,972.
Talc, steatite, soapstone, pyrophyllite	293	158	--	Austria 129.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black[2]	29,377	31,908	--	U.S.S.R. 30,044.
Coal: Bituminous[2] thousand tons	5,090	5,480	--	U.S.S.R. 5,330.
Coke and semicoke[2] do	407	483	--	U.S.S.R. 334; Czechoslovakia 38.
Petroleum refinery products thousand 42-gallon barrels	240	409	(3)	United Kingdom 158; Italy 136.

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[p] Preliminary. NA Not available.

[1] Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Bulgaria, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2] Official Trade Statistics of Bulgaria.

[3] Less than 1/2 unit.

[4] Excludes quantity valued at $486,000.

[5] Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

[6] Excludes quantity valued at $126,000.

COMMODITY REVIEW

METALS

Copper.—Bulgaria's main copper ore production was concentrated in the Srednogorie Mountains in central Bulgaria, where the Medet, Elatsite, and Tsar Asen opencast mines were in production. Another 10% of the copper ore was obtained in the Burgas and Panagyurishte underground mines. The metal content of the porphyry copper ore at the Medet Mine, the largest in Bulgaria, was 0.4%, largely as chalcopyrite, with pyrite and molybdenite. Recovery of copper at the Medet beneficiation plant was reported as 86.7% and concentrates contained 22% copper.

Over L733 million was expected to be invested during 1981-85 to increase the production of ore and to continue the renovation of the Georgi Damyanov copper plant in the town of Srednogorie. In 1983, capacities were put into operation in main copper ore producing and processing combines at the Elatsite and Assarel Mines. The Assarel copper mine and concentrator, with a projected capacity of 15 million tons of ore per year, was one of the major projects of the 1981-85 5-year plan.

Iron and Steel.—The Kremikovtsi iron and steel plant was the country's largest industrial complex. Modernization and reconstruction plans included comprehensive automation. New equipment was commissioned, improving the blast furnace and converter processes and increasing rolled metal output. Completion of the expansion of the continuous billet mill was scheduled for yearend 1984. Czechoslovakia's Skoda Plzen Concern was cooperating in the project. Argon-oxygen decarburization for stainless steel was introduced in 1983. The fourth coke battery with design capacity of 650,000 tons per year was put into operation. It was built to Soviet design, and Soviet and Polish specialists provided assistance in the construction. Its output will make possible a considerable reduction in imports of coke.

The first of four new 100-ton electric furnaces, designed to produce 500,000 tons of steel per year, produced the first steel by continuous casting at the Lenin iron and steel enterprise in Pernik. When the four furnaces and three continuous-casting installations are completed in 1985, the enterprise will produce annually more than 1 million tons of construction, low-alloy, and other types of steel.

A new iron and steel enterprise was under construction near Burgas. Most of its equipment was imported from the German Democratic Republic, but Bulgarian computers were to be used for the automation system. The electric-furnace shop was designed to produce 900,000 tons of steel per year and the rolling mill was designed to produce 640,000 tons per year of steel rolled products. In a plant near the town of Radomir, the casting of the first steel in Bulgaria in a fully automated electric furnace was reported.

Lead and Zinc.—Lead-zinc deposits, concentrated in the central and western Rhodope regions, consist of several ore zones. The main ore zone is Madan with several ore deposits, including Madan, Laki, Nedelino, Davidkovo, and Ardino. The principal part of the lead-zinc ore in the Madan Field occurred in quartz-carbonate-sulfide veins. Ore minerals were galena and sphalerite, accompanied by pyrite, chalcopyrite, and other sulfides. Geophysical prospecting was most active in the deep mines. Bulgaria had several lead-zinc mining enterprises, but the Gorubso Mining and Dressing Combine produced about 70% of the total. Development of a new ore mining and concentrating unit, operated by Gorubso, started at the Erma River deposits. All Bulgarian ore was mined underground to a depth of about 450 meters. Total consumption of lead and zinc was approximately 120,000 and 70,000 tons per year, respectively. Lead and zinc concentrates were processed at the Plovdiv and Kurdjali smelters.

Gorubso had several ore processing facilities including Rudozem, Srednogortsi, Madan, Leki, Erma River, and Kurdjali. The Kurdjali lead-zinc smelter, built in the 1950's in the eastern Rhodope Basin, treated complex ores and produced lead, zinc, cadmium, bismuth, and other byproduct metals. The Plovdiv smelter, started in the early 1960's, 150 kilometers southeast of Sofia, which was the only other lead smelter in Bulgaria, processed local complex lead-zinc ores obtaining lead, electrolytic zinc, cadmium, and other byproducts.

NONMETALS

Fertilizer Materials.—A nitric acid plant was brought into operation in the Stara Zagora. The assembly of a 450,000-ton-per-year ammonia plant started at the Dimitrovgrad chemical complex. All the technical processes were to be automated, and by using natural gas instead of asphalt and bitumen, 243,000 tons of fuel per year would be saved. All heavy equipment in the plant, consisting of 22 large units, was supplied by the U.S.S.R. A 10,000-ton-per-year calcium phosphate unit was expected to start at the Devnya Chemical Combine in the near future.

Production of nitrogenous fertilizer increased by about 10%. A third urea unit at Vratsa came on-stream in January, 1 year late, permitting increased exports in 1983. Bulgarian urea capacity expanded by 92,000 to 687,000 tons per year of nitrogen.

Sand (Silica).—In Bulgaria, silica sand was produced as a byproduct of kaolin processing; the resultant sand was suitable for use in the glass industry, after the removal of iron by magnetic separators, and for foundry sand, after size classification. Increased silica sand production was planned, but not as a kaolin byproduct.

MINERAL FUELS

Coal.—Production of coal slightly increased compared with that of 1982. Most of the coal production was lower rank lignite and brown coal. About 90% of proven coal reserves in Bulgaria consisted of low-rank, high-moisture, and relatively high-ash lignites, with a caloric value between 1,200 and 1,600 kilocalories per kilogram.

About 83% of Bulgaria's coal was mined by opencast methods. The Maritsa East lignite field was the country's largest coalfield, with about two-thirds of the total coal output. Reconstruction and modernization of production facilities in two large opencast mines, Troyanovo-South and Troyanovo-North, with planned annual output capacities of 26 million and 19.5 million tons of coal, respectively, were underway. The use of continuous mining technology in stripping and mining operations was expanded. The coal was mined by bucket-wheel excavators and transported to the power station by conveyors with 1.6-meter-wide belts. Data processing and computer techniques for process and transport control were being introduced. Underground coal mining in Bulgaria was concentrated in the Bobovdol, Maritsa West, and Pernic Coalfields. Mining involved difficult geological and mining conditions, including variable seams, weak rock, high rock pressure, heavy faulting, and high methane content of the coal.

Reconstruction and renovation of equipment in deep mines continued. A new integrated face mechanization system was introduced. Up-to-date equipment was installed in several coal preparation plants. Further plans were laid for development of the new Dobrudja, Elkhovo, Lom, and Sofia coal deposits; modernization of opencast mines in the Maritsa East Coalfield; expanding and increasing the efficiency of mechanization in underground coal mining under difficult conditions; and introduction of automated control systems. Deposits of the Dobrudja region, which were estimated to contain 1.2 billion tons of coal, were to receive particular attention, but plans were delayed owing to the technical obstacles involved and the high investment required.

Natural Gas.—Domestic gas production continued to be insignificant. The U.S.S.R. supplied all of Bulgaria's gas imports. The main ring of the national grid system continued to be under construction.

Petroleum.—Bulgaria was producing about 5,500 barrels per day of domestic crude oil, mainly in the northwest. In 1983, 90% of crude oil imports came from the U.S.S.R. It was unlikely that the quantity of imports from the Soviet Union would increase, and additional growth in energy imported from the U.S.S.R. would probably be in the form of natural gas and steam coal. A Soviet drilling platform arrived in Bulgaria's territorial waters to confirm some of the results of joint geophysical research; in the course of which, a number of areas were identified as promising. Bulgaria entered an agreement with the U.S.S.R. to explore in the Baltic Sea where the Soviet Union earlier had conducted geophysical work.

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[1] Foreign mineral specialist, Division of Foreign Data.

[2] Official exchange rate for the Bulgarian lev (L) for 1983 was L0 .99=US$1.00, but values were not converted because the lev is not freely convertible.

The Mineral Industry of Burma

By Gordon L. Kinney[1]

The most important minerals or mineral related commodities produced in Burma during 1983 in descending order of estimated value were crude oil, natural gas, tin, fertilizer, cement, copper, silver, lead, and gem stones. About 22 other minerals were exploited commercially during the year. Copper ore and concentrate were produced at the Monywa copper mine for the first time.

None of the minerals was produced in enough volume to be of major significance on the world market. Crude oil production was enough to barely satisfy the country's needs. Petroleum shortages have become a significant drag on the economy as the Burmese Government continued with the policy of not importing crude oil, even at the cost of increasingly severe shortages and decreased economic development.

The mining industry employed about 83,000 persons during fiscal year (FY) 1982.[2] About 13,000 were employed by the cooperative private-government and private sectors, the remaining were employed in the state-owned mining operations. The mining sector accounted for 4.5% of total Government employees, while only 0.1% of privately employed persons were in the mining category. The mining sector accounted for 1.2% of the value of the net output of goods and services at current prices.

The value of the net output of the mining sector at constant 1969 prices was $31.7 million[3] during FY 1982 (excluding mineral fuels). This was 88.5% of the value for the mining sector contained in the Government's annual plan. Despite not reaching the goal, the net economic growth rate of the mining sector increased 26% over that of FY 1981. This was the largest increase of the 12 sectors listed for the overall economy in the report to the Pyithu Hluttaw (Burmese legislature).

The main objectives of Government for the mining sector during the 4-year plan starting in FY 1982 were as follows: increase mineral production to the limit of financial resources, particularly that of crude oil; increase mineral exports; minimize losses and waste in production of minerals; explore for and increase production of the industrial minerals; and increase the value of net output of the mining sector by an annual average rate of 12.8%.

According to Burmese Government estimates for FY 1982, $125 million was invested in the mining sector, or 11.1% of the total public investment. The planned public investment in the mineral industry for FY 1983 was $74 million or 6.8% of total investment. The drop in investment[4] was accounted for by the completion of the major expenditures for the Monywa copper mine project, the tin smelter, the direct-reduction iron project, and much of the expenditure for the Bawdwin Mine and concentrator expansion.

Economic growth continued to slacken during FY 1982 and into FY 1983. Gross domestic product (GDP) for FY 1982 increased to $6.1 billion, but considered in constant 1969 prices, the GDP remained at $2.3 billion, the same as in FY 1981 and down marginally from the $2.4 billion of FY 1980.

Faced with a decline in world commodity prices and volume of trade, Burma's foreign exchange situation has deteriorated over the last 2 years. Foreign exchange holdings fell from $255 million in March 1981 to $53 million in March 1983. The value of exports declined by $61 million. During the same period, imports grew by $206 million, increasing the trade deficit from $206 to $473 million. Bilateral and multilateral loans and grants financed much of the trade deficit, but despite this help, the balance of payments declined from plus $33 million in FY 1980 to minus $118 million in FY 1982.

Burma's development plans reflected a conflict between goals of export promotion and self-sufficiency. Self-sufficiency continues to be popular among Burmese leaders, but there was growing recognition that Burma must export more if it was to progress. Under new Government-subsidized agricultural programs, rice production, a major export item, has increased 65% since 1972.

PRODUCTION

The value of the output of the mining sector continued to increase for the seventh consecutive year in FY 1982. According to the Ministry of Planning and Finance, the mining output at current prices was $128 million for FY 1982.[5] The value of crude oil and natural gas, estimated at world market price, would be on the order of $300 million.

By far the most important minerals produced in 1983 were crude oil and natural gas. Copper ore and concentrate were produced for the first time at the Monywa Mine. The value of this output will probably be second to fuels when copper output reaches operating capacity. Tin production was second in value for the metals group and tungsten, lead, zinc, barite, gypsum, coal, and some of the clay minerals were also important. Tin metal production was reported for the first time as the small smelter at Syriam came on-line.

Table 1.—Burma: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Antimony, mine output:					
Gross weight	1,690	1,094	875	--	--
Sb content[e]	680	440	350	--	--
Copper:					
Mine output, metal content	67	56	77	101	[3]4,200
Matte, gross weight	148	123	170	223	[3]170
Iron and steel: Pig iron	--	--	3,753	13,328	[3]15,200
Lead:					
Mine output, metal content[e]	15,000	14,200	16,100	16,050	17,000
Metal:					
Refined including secondary	6,237	6,014	4,068	7,829	[3]7,636
Antimonial lead (18% to 20% Sb)	185	185	254	279	[3]254
Nickel:					
Mine output, metal content[e]	18	14	20	20	20
Speiss, gross weight	67	57	80	81	[3]80
Silver, mine output thousand troy ounces	340	587	450	526	[3]558
Tin, mine output, metal content:					
Of tin concentrate	573	540	596	804	[3]629
Of tin-tungsten concentrate	660	750	842	877	[3]1,013
Total	1,233	1,290	1,438	1,681	[3]1,642
Tungsten, mine output, metal content:					
Of tungsten concentrate	276	305	248	243	[3]235
Of tin-tungsten concentrate	416	518	577	601	[3]695
Total	692	823	825	844	[3]930
Zinc, mine output, metal content	3,028	4,079	3,556	5,382	[3]4,537
NONMETALS					
Barite[4]	39,486	4,819	[e]10,200	19,915	11,200
Cement, hydraulic	390,606	386,159	317,434	344,225	342,000
Clays:[4]					
Ball clay	4,294	4,390	793	409	[3]404
Bentonite	1,446	1,347	2,317	1,463	[3]711
Fire clay[5]	4,413	3,711	1,755	1,633	1,780
Industrial white clay	6,876	4,626	813	813	[3]813
Feldspar[4]	2,004	1,689	4,267	2,540	2,700
Graphite[4]	268	199	1,422	279	[3]200
Gypsum[4]	38,265	37,132	31,095	26,079	[3]34,278
Pigments, mineral, natural: Iron oxide	369	330	350	[e]350	350

See footnotes at end of table.

Table 1.—Burma: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Precious and semiprecious stones: Jadeite[4] kilograms	7,707	7,953	8,891	9,682	[3]29,107
Salt[6] thousand tons	258	268	270	269	[3]288
Stone:[4]					
Dolomite	1,882	2,450	6,381	3,250	[3]4,400
Limestone, crushed and broken thousand tons	1,259	1,151	1,219	1,221	[3]1,247
Quartz	122	143	37	39	--
Talc and related materials: Soapstone[4]	394	333	128	128	[3]128
MINERAL FUELS AND RELATED MATERIALS					
Coal (lignite)	36,064	26,919	38,100	38,200	[3]34,500
Gas, natural:					
Gross[e] million cubic feet	18,000	24,000	28,000	28,000	31,000
Marketed[4] do	12,030	14,837	14,878	24,640	29,600
Petroleum:					
Crude (gross wellhead) thousand 42-gallon barrels	10,822	10,110	10,447	10,549	11,500
Refinery products[e] do	[3]7,238	7,300	7,670	7,000	7,000

[e] Estimated. [p] Preliminary.

[1] Table includes data available through June 17, 1983.

[2] In addition to the commodities listed, pottery clay, common sand, glass sand, other varieties of crude construction stone, and other varieties of gem stones are produced, but available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

[4] Data are for fiscal years beginning Apr. 1 of that stated.

[5] Includes fire clay powder.

[6] Brine salt production as reported by the Burma Government was as follows: 1980—80,701; 1981—83,795; 1982—73,901; and 1983—100,000 (estimated).

TRADE

Exports of minerals fell short of the target in FY 1982, but tin, tungsten, and mixed scheelite concentrates exceeded the Government's target. Comparing provisional export data with 1981 figures, both zinc concentrates and petroleum coke showed substantial increases. Refined tin from the Syriam smelter and copper concentrate from Monywa were exported for the first time. Although exports of important commodities increased in volume in FY 1982, export earnings declined because of lower prices in many foreign markets.

Overall, exports declined from $443 to $390 million in 1982, while imports increased from $736 to $863 million, giving a trade deficit of $473 million. The higher import figure was due in part to an increase in the requirement for capital goods for the implementation of new and on-going projects for economic development.

COMMODITY REVIEW

METALS

Copper.—The Monywa copper mine continued to add equipment, despite the mine and concentrator's official opening in 1982. In January, two additional excavators worth $250,000 were delivered to Rangoon under a technical assistance program of the Yugoslav Government. They were to be shipped to the mine to increase capacity. A limestone mine and a fully automated, 120-ton-per-day lime plant began operating near Rangoon. The facility was jointly built by a Yugoslav firm and the Burmese state construction corporation. Output mainly will be used in the copper concentration plant to control the pH of the processing solution. Plans were still in the works for a 20,000-ton-per-year copper smelter[6] at Salingyi to process the concentrates from Monywa.

Iron and Steel.—The second module of the Kinglor Metor direct-reduction plant at Anisakan was reported to be under construction. The 20,000-ton-per-year unit was scheduled for late 1983 completion, but electric power problems could delay construction and startup. Nearly a carbon copy of the first unit, the only major difference will be preheating the combustion air, saving energy. Both units will use inert combustion gases to dry and preheat the raw materials charge, which is composed of domestically produced limonitic iron ore, lignite, and limestone.

The final choice for the first steel furnace at Anisakan, completed in 1982, was an 18-ton, 8-megavolt-ampere electric arc furnace chosen for its flexibility compared with other melting systems. The furnace uses the 100% direct-reduced iron from the Kinglor module and currently is producing all pig iron for the several small foundries in Burma. A second, identical, electric furnace will be installed for steelmaking, together with an oxygen plant and a two-strand continuous caster. A Government report stated that the expansion project was 60% completed and would be operating in 1984.

Bids were received in 1983 for renovating the steel rolling mill at Insein with Japanese financial and technical assistance. The existing electric arc furnace will be modernized and its capacity increased from 10,000 to 12,000 tons per year. A new two-strand continuous billet caster will be installed, and the rolling mill will be modernized and increased in capacity from 20,000 to 48,000 tons per year. The wire mesh production facility will be doubled to 16,000 tons per year. A contract for construction will be awarded to one of six Japanese groups that bid on the job in September.

Iron ore for the direct-reduction plant at Anisakan reportedly will come from an Italian-aided mine newly opened at Maymyo in the Mandalay area.[7] No details were available on this mine.

Lead, Zinc, and Silver.—Currently, the famed Bawdwin Mine is Burma's only source of lead, zinc, and silver ore. Expansion of the Bawdwin concentration plant from 500 to 1,000 tons per day of ore has been underway since FY 1980 with a loan from the Federal Republic of Germany. When completed, this expansion will increase the export earnings from refined and antimonial lead, silver, zinc concentrate, copper matte, and nickel speiss.

Equipment for the conversion of the mine from underground to open pit was delivered in 1983. The Federal Republic of Germany was also furnishing financial aid and equipment for this project.

Zinc-rich slag accumulated for 60 years at the Bawdwin Mine before the zinc content of the primarily lead and silver ore began to be recovered. Over 3 million tons of 17% zinc content slag was available for exploitation. Recovery of this potentially valuable waste had been studied recently and both West German and Australian technologies were applicable. In addition, the No. 1 Mining Corp., owner of the Bawdwin Mine, controlled 1.2 million tons of silver-bearing mill tailings produced at Bawdwin prior to World War II. Using a process developed in the Federal Republic of Germany, the silver could be extracted. The process would be economically viable at a silver price of $9.40 per ounce or above.

Tin and Tungsten.—The Burmese Government continued with its Heinze Basin project, which was the outcome of the United Nations assisted study of the tin-tungten deposits in the Tenasserim Div. near the Andaman Sea coastline. The Government-owned No. 2 Mining Corp. was the owner and operator of the five new gravel pump mines. The foreign exchange cost of the mines was about $30 million, of which the Asian Development Bank financed $16 million. The No. 2 Mining was continuing to evaluate other deposits of the Tenasserim Valley in the Tenasserim Div. for possible future exploitation. These Heinze Basin deposits were part of the Southeast Asian tin belt that runs for 2,900 kilometers from northern Burma through Thailand and Malaysia and into the islands of Indonesia.

The aggregate in situ ore reserves for the five mines was calculated at over 29 million tons at an average grade of 0.062% tin. Tungsten content varies with the local geology but, although much lower than the tin content, was still sufficient to warrant recovery as a valuable byproduct.

The typical gravel pump operation of the mines was assisted by bulldozers, which helped to maintain feedstock to the water monitors and minimize the need to move the pumps and nozzles. Typical ore concentration methods were being used at the mines. One possible addition was the use of spiral classifiers to scavenge the tailings because of the high percentage of very fine grained ore in these particular deposits. The personnel requirement for the five mines was estimated at 900. Projected production for the five mines was over 925 tons of 60% tin concentrate per year.

A tin and tungsten concentration plant was planned for the Tenasserim Valley to upgrade the material from the gravel pump operations. The plant will be similar to the completely refurbished Tavoy plant. The only flowsheet changes will be that electrostatic separation will precede the magnetic separation circuit.

According to a Government document, the new tin smelter at Syriam, near Rangoon, operated satisfactorily during FY 1982 and produced 750 tons of refined tin.[8]

Other Metals.—The Geological Survey from the Federal Republic of Germany was reportedly working with Burmese officials to investigate a chromite and nickel discovery in the Arakan Yoma mountain range (19°00'N, 94°40'E). The deposit was still being evaluated at yearend.

NONMETALS

Cement Raw Materials.—The Government continued to increase production of limestone, clay, and gypsum to supply new cement capacity that was under construction.

The Kyangin cement plant expansion project continued during the year. Production at the 1,400-ton-per-day plant was scheduled to begin at the end of FY 1983.

Progress on the new 840-ton-per-day Pa-an cement mill continued. Reportedly, 60% of the construction work had been accomplished, and production was scheduled to begin also by the end of FY 1983. According to the Burmese press, Karen rebels raided the construction site in October. There were no details about damage to the plant, but two foreign nationals working at the site were abducted during the raid. This type of incident could have a negative effect on the implementation of the construction scheduled.

MINERAL FUELS

As the Burmese economy has improved and the population increased, so has the need to increase crude oil production. Burma has been engaged in a vigorous effort to increase production both by drilling additional production wells in the operating fields and by drilling for new discoveries both onshore and offshore.

By law, all oil exploration, production, and processing was reserved for the Myanma Oil Corp. (MOC), a state-owned company. Because of the urgency of locating new fields and of getting new production started, the Government made a special agreement with the Japanese Government-owned Japan National Oil Corp. and another Japanese consortium. The group was to jointly explore for offshore oil in the Gulf of Martaban. By the end of 1983, the drilling program had met with at best only limited success. A natural gas discovery was announced off the Martaban coast late in 1982 and apparently a second field was also located in the same area during the 1983 drilling. Development of these deposits was unlikely at this time because of the high capital cost involved and the lack of a ready market. Currently, several onshore fields produce gas at about the rate that the Burmese economy can efficiently utilize it. The only oil discovered was a reported flow of 132 barrels per day from a depth of 2,300 meters. That small a flow rate would probably not warrant commercial offshore development.

Onshore MOC was conducting its own exploration with 19 survey teams operating in the field. The geophysical, seismic, and gravimetric surveys were being concentrated in three main areas: the middle Irrawaddy Basin in upper Burma, the Prome Valley region, and the Irrawaddy Delta.

MOC recently added 2 deep and about 12 shallower drilling rigs to its existing inventory of 35 mostly older drill rigs. Latest available data showed that MOC drilled 178 wells in 1981 and 144 wells in 1982, most of which were production wells. Thirteen of the exploration wells yielded oil or natural gas in 1982.

Three new fields were given a great deal of publicity in 1982 but have so far proved to be only very modest oil producers in 1983. Ten of 27 wells drilled at the Tantabin Oilfield in 1982 were productive and yielded a flow of 600 barrels per day. The Kyontani Field yielded only traces of natural gas. At Tuyintaung, 6 of 10 wells yielded 130 barrels of oil per day and 230,000 cubic feet of gas per day. MOC has estimated the reserves in these three fields at 1,400 million barrels. It remains to be seen how much of that is recoverable. MOC also claimed that 35 other promising structures have been identified in the Irrawaddy Delta through its surveying activity.

The Government-owned Petrochemical Industries Corp. has awarded a $64 million contract for the construction of a 450-ton-per-day methanol plant to be built at Seiktha. The plant will be built by a joint venture of Voest Alpine AG and Lurgi Kohle und Mineralöltechnik GmbH. The contract included engineering, delivery of plant and auxiliary equipment, and startup supervision. Raw material for the plant will be natural gas.

Burma has had problems sustaining its crude oil production for several years. Wellhead figures announced publicly include a water and gas content of 20% to 25%. Refineries have been operating at well below capacity. The shortages of diesel fuel kept many industries and projects from functioning at full capacity. A widespread black market in petroleum thrives. Depending on location and other factors, black-market gasoline costs between 4 and 40 times the official price of $0.50 per imperial gallon.

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[1] Physical scientist, Division of Foreign Data.

[2] The Burmese fiscal year begins Apr. 1 of the year stated.

[3] Values have been converted from Burmese kyats (K) to U.S. dollars at the average rate in FY 1980 of K6.62=US$1.00; FY 1981, K7.32=US$1.00; and FY 1982, K7.76=US$1.00.

[4] Ministry of Planning and Finance. Report to the Pyithu Hluttaw on the Economic and Social Conditions of the Socialist Republic of the Union of Burma for 1983-84. 1983, p. 299.

[5] Page 25 of work cited in footnote 4. Value excludes mineral fuels.

[6] Metric tons are used throughout this report.

[7] Far Eastern Economic Review. Asia 1984 Yearbook. P. 140.

[8] Page 264 of work cited in footnote 4.

The Mineral Industry of Canada[1]

By Harold R. Newman[2]

After the most severe and prolonged recession in its history, the Canadian mineral industry experienced moderate growth. The mineral industry made major efforts to streamline operations, increase productivity and efficiency, and identify strengths and weaknesses. Such measures have reduced some companies' unit operating costs and consequently have placed them in an excellent position to take advantage of the economic recovery. Higher mineral prices and lower interest rates during 1983 helped the industry to reduce its losses compared to record-high losses for some producers in 1982. Higher demand in the consumer market, particularly for automobiles and housing, had a positive impact on the mineral industry. There was a real growth in the gross national product (GNP) of 3.5%. At yearend, overall unemployment in Canada was about 11%.

On a world scale, Canada ranked third as a mineral producer behind the United States and the Soviet Union. On a per capita basis, however, Canada was first among the major mineral-producing countries. The country continues to be the leading producer of asbestos, nickel, potash, and zinc, and the second largest producer of molybdenum and uranium. Also, Canada ranked first in the world in mineral exports. Over 80% of the country's mine output was shipped to more than 100 countries. The importance of these exports to the nation's well-being was very significant. Canadian mining products accounted for 20% of total national exports and, directly and indirectly, about 6% of all employment.

Although Canadian mineral deposits rank among the best in the world, the mineral industry realizes that its survival depends on productivity improvements, technological advances, and improved marketing practices. Canada's mining industry was expected to continue to improve with increased economic activity and economic recovery in the Western industrialized countries. The United States is the principal customer for Canadian mineral products; therefore, economic conditions in the United States have a significant impact on the Canadian mineral industry.

Government Policies and Programs.—There was continuing and increasing Canadian recognition of the negative impact of the Foreign Investment Review Agency (FIRA) and the National Energy Program (NEP) on Canadian interests. In July 1983, FIRA announced it would streamline its application procedures and raise the threshold for eligibility for shorter notice forms and review procedures when a foreign company proposed to make a new investment in Canada or acquire, directly or indirectly, a Canadian company. An international panel representing the General Agreement on Tariffs and Trade (GATT) Council ruled that FIRA violated GATT's article 3, which requires countries to treat domestic and foreign-owned companies equally. FIRA had required some companies to promise to restrict imports and to buy materials in Canada in return for approval of their applications to acquire or set up Canadian businesses. The Government was studying the decision to see what changes it might make to FIRA.

The decline in international oil prices

during 1982-83 has undermined the basic foundation of Canada's energy policy, which was predicated on the assumption that international oil prices would increase significantly during 1982-86. This did not occur and subsequently caused internal inconsistencies in major elements of the NEP. The Government has made many modifications in the NEP, and future changes are under consideration. Specifically, the Government has encouraged joint ventures and farm-out arrangements and downplayed "buyouts" of foreign companies as more appropriate methods of increasing Canadian ownership and control of the energy industry. The Canadian political system regards the general goals of the NEP as legitimate and important, and although the more extreme and controversial methods to achieve these goals are being modified, a policy to increase Canadian ownership of the energy industry is likely to be permanent.

PRODUCTION

According to the Canadian Department of Energy, Mines and Resources (EMR), the total value of Canada's mineral production, including fuel and nonfuel minerals, in 1983 was $28.9 billion,[3] about 9% of the GNP. This represented modest growth over the $27.2 billion in 1982. In 1983, the 10 leading minerals were petroleum, natural gas, natural gas byproducts, copper, coal, gold, iron ore, zinc, nickel, and cement, which represented 87% of the total value of output of the mineral industry. Output of all of these minerals except cement, iron ore, and natural gas showed increases over that of 1982.

The performance of the base metals industry was improved over 1982, although demand was neither strong nor sustained. Precious metals production provided encouragement to the industry. The value of gold output at $958 million was 23% higher than that of 1982. Copper increased about 4% to $1 billion, and zinc increased almost 1% to $782 million. However, iron ore value fell almost 5% to $920 million, and the value of uranium shipments fell almost 14% to $582 million.

Asbestos value increased about 10%, although shipments decreased from 834,219 to 829,359 tons in 1983. The combined factors of the recession, adverse publicity regarding health risks, and recent regulations introduced to restrict its use have had a significant impact on the asbestos industry. Although potash shipments set a record, lower prices kept the value of output below that of 1982. The upturn in the housing and construction industry had a generally favorable impact on some construction commodities. Gypsum shipments were at a record-high level of 7.5 million tons. However, cement shipments went through a second consecutive year of low demand. Cement producers were operating at about 53% capacity at yearend.

In the energy sector, production increased from 42.8 million tons in 1982 to 44.3 million tons. Crude oil production rose 6% to almost 495 million barrels. Reduced demand in Canada and the United States resulted in a drop in marketed natural gas from 2.7 billion to 2.5 billion cubic feet.

The value of mineral output increased in 4 of 10 Provinces. The Province of Alberta, with its large oil and gas output, accounted for approximately 62% of Canada's total mineral value. Production values of the Provinces and Territories follow:

Province or Territory	Value, billion U.S. dollars	
	1982[r]	1983[p]
Alberta	16.8	17.9
Ontario	2.5	2.9
British Columbia	2.3	2.3
Saskatchewan	1.9	2.2
Quebec	1.7	1.5
Newfoundland-Labrador	.5	.5
Manitoba	.4	.5
New Brunswick	.4	.4
Northwest Territories	.4	.4
Nova Scotia	.2	.2
Yukon Territory	.1	(1)
Prince Edward Island	(1)	(1)
Total	27.2	28.9

[p] Preliminary. [r] Revised.
[1] Less than 1/2 unit.

Source: Department of Energy, Mines and Resources, Ottawa, Canada. Canadian Mineral Survey, 1983.

Table 1.—Canada: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983[p]
METALS					
Aluminum:					
Alumina, gross weight thousand tons	824	1,202	1,208	[e]1,127	1,116
Metal:					
Primary	860,256	1,068,198	1,115,691	1,064,795	1,091,231
Secondary	84,472	65,147	59,281	62,000	63,000
Antimony[e] [2]	2,954	2,361	1,670	907	--
Bismuth[3]	139	150	168	189	202
Cadmium[4]	1,460	1,303	1,298	809	1,107
Calcium kilograms	455,713	531,000	469,403	W	W
Cobalt:					
Mine output, metal content[5]	1,640	2,118	2,080	1,404	1,584
Metal[6]	1,424	1,018	1,277	1,041	1,060
Columbium and tantalum:					
Columbium concentrate (pyrochlore):					
Gross weight[e]	4,186	3,884	4,100	4,758	3,100
Cb content	1,756	[r]1,722	[r]1,916	2,145	1,300
Tantalum concentrate:					
Gross weight[e]	355	550	289	258	--
Cb content	9	[r]8	[r]9	8	--
Ta content	130	[r]94	[r]94	77	--
Copper:					
Mine output, recoverable metal content[7]	636,383	716,400	619,328	612,455	624,988
Metal, primary and secondary:					
Blister and anode	386,420	492,710	479,046	366,625	375,000
Refined	397,263	505,238	476,655	337,780	464,333
Gold thousand troy ounces	1,644	1,552	1,673	2,081	2,280
Iron and steel:					
Iron ore:[8]					
Gross weight thousand tons	59,888	48,154	51,985	35,425	33,495
Iron content do	37,681	30,803	32,642	22,530	21,300
Metal:					
Pig iron do	10,906	11,183	9,743	8,000	8,567
Ferroalloys do	175	289	282	218	269
Steel, crude do	16,078	15,887	14,811	11,762	12,828
Semimanufactures[9] do	12,235	13,030	13,186	9,556	NA
Lead:					
Mine output, metal content	341,777	296,641	332,045	272,187	255,904
Metal, refined:					
Primary	183,769	162,463	168,450	174,310	178,043
Secondary	68,568	72,117	69,658	67,566	63,914
Magnesium metal, primary	9,015	8,899	8,548	7,900	7,800
Molybdenum	11,174	12,198	12,850	13,961	10,528
Nickel:					
Mine output, metal content[10]	126,481	184,802	160,247	88,581	121,836
Metal, smelter	83,747	152,299	109,303	58,636	87,200
Platinum-group metals troy ounces	197,943	410,757	382,667	228,426	167,019
Selenium, refined[11] kilograms	511,704	453,600	350,010	222,000	295,000
Silver thousand troy ounces	36,874	34,401	36,311	42,246	35,559
Tellurium, refined[11] kilograms	47,204	45,000	21,297	[e]18,000	12,000
Tin, mine output, metal content	337	243	239	135	141
Titanium:					
Ilmenite, gross weight thousand tons	1,004	1,853	2,008	1,735	1,600
Sorel slag (70% to 72% TiO_2)	477,040	847,710	759,191	669,000	612,000
Tungsten, mine output, W content	2,597	3,179	1,993	2,842	327
Uranium oxide (U_3O_8)	7,701	7,947	8,853	7,643	8,483
Zinc:					
Mine output, metal content	[r]1,204,401	1,058,714	1,095,958	1,189,000	1,070,000
Metal, refined, primary	580,449	591,565	618,650	511,870	617,033
NONMETALS					
Asbestos thousand tons	1,493	1,323	1,122	834	840
Barite	67,131	94,317	86,117	27,744	28,000
Cement, hydraulic[12] thousand tons	11,765	10,497	10,145	8,426	7,828
Clays and clay products[13] value, thousands	$142,356	$133,611	$119,116	$95,993	$127,400
Diatomite	1,452	3,615	[e]3,600	2,000	2,000
Gypsum and anhydrite thousand tons	8,098	7,209	7,025	5,987	7,481
Lime do	1,860	2,554	2,555	2,197	2,126
Magnesite, dolomite, brucite value, thousands	$6,990	$10,405	$11,472	$8,216	$8,108
Nepheline syenite	605,699	592,000	587,565	513,538	528,000
Nitrogen: N content of ammonia	1,918,300	2,095,577	2,176,249	2,062,100	2,887,870
Pigments, mineral: Iron oxides, natural	2,700	[e]2,800	(14)	--	--
Potash, K_2O equivalent thousand tons	7,074	7,532	6,549	5,309	6,203
Pyrites and pyrrhotite, gross weight	31,032	32,000	10,198	19,268	10,000
Salt thousand tons	6,881	7,700	7,240	7,940	8,590
Sand and gravel do	285,221	276,452	259,661	207,227	219,680
Silica (quartz)	2,368	2,525	2,238	1,797	1,803
Sodium compounds, n.e.s.:					
Sodium carbonate[e]	450,000	450,000	475,000	475,000	425,000
Sodium sulfate	443,279	480,666	535,214	542,839	447,000

See footnotes at end of table.

Table 1.—Canada: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983^{p}
NONMETALS —Continued					
Stone[15] thousand tons	109,719	103,366	85,041	61,929	68,738
Sulfur:					
Elemental byproduct:					
Of smelter gases do.	667	^{r}903	783	627	730
Of sour natural gas do.	5,935	^{r}5,899	^{r}5,599	5,226	5,390
Of refineries do.	200	^{r}160	^{r}160	160	170
Of tar sands do.	213	^{r}286	^{r}247	259	330
S content of pyrite and pyrrhotite^{e} do.	12	14	^{r}10	9	5
Talc, soapstone, pyrophyllite	90,330	91,848	82,715	72,182	97,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black^{e}	135,000	135,000	130,000	130,000	135,000
Coal:					
Bituminous and subbituminous thousand tons	28,187	30,717	33,290	35,317	36,750
Lignite do.	5,013	5,971	6,798	7,494	8,482
Coke, high-temperature do.	5,685	5,250	4,659	4,000	4,120
Gas, natural:					
Gross million cubic feet	3,780,145	3,541,024	3,019,191	3,076,002	3,372,670
Marketed do.	3,334,618	3,067,711	2,399,415	2,682,747	2,465,100
Natural gas liquids:					
Gross:					
Butane thousand 42-gallon barrels	22,820	21,292	20,443	20,375	19,793
Propane do.	35,844	34,188	33,016	33,547	30,211
Pentanes plus do.	42,038	38,089	36,420	35,366	33,371
Ethane do.	20,612	20,475	29,541	26,698	29,577
Condensate do.	1,255	1,188	1,881	936	880
Total do.	122,569	115,232	121,301	116,922	113,832
Returned to formation, all types do.	^{e}400	NA	NA	NA	NA
Peat	480,087	466,000	461,993	^{e}487,000	544,000
Petroleum:					
Crude[16] thousand 42-gallon barrels	545,465	523,441	467,701	464,122	494,570
Refinery products:					
Gasoline:					
Aviation do.	1,572	1,472	1,480	1,066	1,081
Other do.	240,554	241,778	239,707	212,126	215,000
Jet fuel do.	30,867	30,537	28,841	25,153	18,232
Kerosine do.	24,991	24,184	18,575	16,256	13,803
Distillate fuel oil do.	184,002	181,930	171,907	146,938	81,708
Residual fuel oil do.	113,730	102,124	100,707	74,472	76,000
Lubricants do.	5,366	5,720	5,898	4,860	4,940
Liquefied petroleum gas do.	13,485	13,520	16,337	16,101	15,600
Petrochemical feedstocks do.	35,059	32,894	32,366	28,900	26,962
Asphalt do.	21,241	20,907	19,139	16,065	16,656
Petroleum coke do.	1,029	1,218	20,327	10,623	9,870
Unspecified do.	5,440	5,310			
Refinery fuel and losses do.	34,491	32,035	40,360	36,186	36,000
Total do.	711,827	693,629	695,644	588,746	515,852

^{e}Estimated. ^{p}Preliminary. ^{r}Revised. NA Not available. W Withheld to avoid disclosing company proprietary data.

[1] Table includes data available through July 31, 1984.

[2] Sb content of antimonial lead alloys, flue dust, and doré slag estimated on the basis of reported gross production.

[3] Refined metal and bullion from domestic ores plus recoverable Bi content of exported concentrates.

[4] Refined metal from domestic ores plus recoverable Cd content of exported ores and concentrates.

[5] Actual output not reported. Data represent Co content of all products derived from ores of Canadian origin, including nickel oxide sinter shipped to the United Kingdom and nickel-copper-cobalt matte shipped to Norway for further processing.

[6] Actual output not reported. Data represent the output within Canada of metallic cobalt from ores of both Canadian and non-Canadian origin.

[7] Blister copper from domestic ores plus recoverable Cu content of exported matte and concentrates.

[8] Series revised to reflect actual mine production rather than sales, which were reported as production in previous editions. Sales figures, on a gross weight basis, in thousand metric tons, follow: 1979—59,617; 1980—49,068 (revised); 1981—44,551 (revised); 1982—35,425 (revised); and 1983—24,988.

[9] Includes shipments of ingots from primary plants for rolling elsewhere.

[10] Refined nickel from domestic ores plus Ni content of oxide produced and recoverable Ni content of exported matte.

[11] From all sources, including imports and secondary sources.

[12] Cement shipped and/or used by producers.

[13] Includes bentonite, products from common clay, stoneware clay, fire clay, and other clays.

[14] Revised to zero.

[15] Crushed, building, ornamental, paving, and similar stone.

[16] Includes synthetic crude (from oil shale and/or tar sands).

Table 2.—Canada: Mineral production in 1983, by commodity

(Percent)

Commodity	Share of total[p]
Petroleum, crude	40.3
Natural gas	18.5
Natural gas products	7.2
Coal	3.6
Copper	3.6
Gold	3.3
Iron ore	3.2
Zinc	3.1
Nickel	2.1
Cement	1.8
Other	13.3
Total	100.0

[p] Preliminary.

Sources: Department of Energy, Mines and Resources, Canada, and Statistics Canada, 1983.

In 1983, about 22 metals and 21 nonmetallic minerals were produced by 274 operating mines, 230 mills, 16 smelters, and 15 refineries. Mining activities were conducted in every region of the country. The values of principal mineral production follow:

Commodity	Value, million U.S. dollars	
	1982[r]	1983[p]
METALS		
Copper	962	1,000
Gold	779	958
Iron ore	967	920
Zinc	778	782
Nickel	484	617
Uranium (U)	674	582
Silver	334	403
Lead	159	123
Molybdenum	128	84
Total	5,265	5,469
NONMETALS		
Cement	543	524
Potash, K_2O equivalent	508	500
Asbestos	294	324
Salt	126	140
Lime	114	112
Clay products	77	81
Gypsum	27	46
Total	1,689	1,727
MINERAL FUELS		
Petroleum	11,164	13,039
Natural gas	5,846	5,332
Coal	1,042	1,047
Total	18,052	19,418

[p] Preliminary. [r] Revised.

Source: Department of Energy, Mines and Resources, Ottawa, Canada. Canadian Mineral Survey, 1983.

TRADE

The Canadian mineral industry was mainly export oriented, and the general weakness of the international markets was reflected in the decrease of exports of metallic and nonmetallic minerals. Value of mineral and metal exports was about 16% of total value of all exports of Canadian products. About 80% of Canadian output was sold abroad. The United States was the major customer for these exports in 1983. Canada was dependent on mineral imports for some of its requirements, such as bauxite, phosphate rock, chromium, manganese, and tin. Other minerals were also imported for geographic and economic reasons. The energy minerals—crude oil, natural gas, and coal—accounted for a majority of all mineral imports.

Table 3.—Canada: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	[r]48,265	30,585	25,355	United Kingdom 2,245; France 860; Venezuela 660.
Metal including alloys:				
Scrap	[r]85,765	69,015	58,855	Pakistan 8,515; West Germany 550; Spain 455.
Unwrought	725,440	988,075	461,460	China 185,205; Japan 177,650; Hong Kong 50,060.
Semimanufactures[2]	40,546	48,520	37,535	Mexico 1,150; Philippines 1,015; Egypt 625.

See footnotes at end of table.

Table 3.—Canada: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Cadmium: Metal including alloys, all forms	1,453	769	378	United Kingdom 319; U.S.S.R. 60; Netherlands 10.
Cobalt:				
Oxides and hydroxides	601	760	--	Mainly to United Kingdom.
Metal including alloys, all forms	676	585	527	Japan 17; Mexico 12; Netherlands 10.
Copper:				
Ore and concentrate	276,810	284,315	21,500	Japan 201,630; Norway 16,550; Republic of Korea 16,400.
Ash and residue containing copper	677	1,490	1,215	Spain 270; United Kingdom 5.
Metal including alloys:				
Scrap	35,185	56,695	34,820	Japan 5,790; Belgium-Luxembourg 5,160; Spain 2,005.
Unwrought	262,641	256,420	102,755	United Kingdom 72,620; West Germany 24,460; Belgium-Luxembourg 16,090.
Semimanufactures	39,248	35,210	26,960	Venezuela 2,260; Cuba 825.
Gold:				
Ore and concentrate troy ounces	176,901	162,037	23,658	Japan 98,343; Belgium-Luxembourg 7,867; Taiwan 6,307.
Metal including alloys, unwrought and partly wrought thousand troy ounces	2,677	2,840	2,655	Netherlands Antilles 49; Panama 31; Japan 18.
Iron and steel:				
Iron ore and concentrate thousand tons	40,545	30,071	9,960	Netherlands 4,906; Japan 3,254; West Germany 2,907.
Metal:				
Scrap do	572	625	401	Spain 90; Republic of Korea 73; Italy 23.
Pig iron, cast iron, related materials	589,619	567,298	133,975	Netherlands 235,238; Japan 72,243; Italy 47,808.
Ferroalloys:				
Ferromanganese	57,039	12,939	12,611	United Kingdom 155.
Ferrosilicon	52,410	45,004	15,936	Japan 24,626; Republic of Korea 2,803; Australia 217.
Unspecified	5,316	5,574	2,869	United Kingdom 2,374; Japan 135; Mexico 57.
Steel, primary forms	894,595	284,623	176,385	Jordan 32,798; Philippines 18,679; Algeria 18,030.
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	880	858	678	Ecuador 11; Tunisia 11; United Kingdom 11.
Universals, plates, sheets do	975	2,373	544	Iran 324; West Germany 92; Turkey 59.
Rails and accessories	192,688	117,882	69,072	Bangladesh 21,122; Italy 15,721; India 11,535.
Wire	106,857	106,126	104,366	Hong Kong 554; Republic of South Africa 468.
Tubes, pipes, fittings	502,915	305,479	267,840	United Kingdom 12,541; Iraq 10,180; Venezuela 6,303.
Castings and forgings, rough	143,884	115,085	111,131	Mexico 2,182; Australia 554; United Kingdom 421.
Lead:				
Ore and concentrate	146,090	117,660	12,565	Japan 40,705; West Germany 18,265; Australia 13,995.
Metal including alloys:				
Scrap	9,781	17,515	6,890	Sweden 2,765; West Germany 2,470; Belgium-Luxembourg 2,280.
Unwrought	119,815	161,075	58,535	United Kingdom 40,830; Belgium-Luxembourg 18,320; U.S.S.R. 12,120.
Semimanufactures	6,819	7,320	6,585	Taiwan 215; Italy 110; Portugal 100.
Magnesium: Metal including alloys	6,222	4,520	795	West Germany 1,196; Japan 1,139; United Kingdom 547.
Molybdenum: Ore and concentrate[3]	13,664	19,225	2,480	Netherlands 3,685; Japan 3,510; Belgium-Luxembourg 3,305.
Nickel:				
Ore and concentrate	53,840	29,800	(4)	Norway 21,755; United Kingdom 8,044.
Oxides and hydroxides	14,390	14,470	5,215	NA.

See footnotes at end of table.

Table 3.—Canada: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Nickel —Continued				
Metal including alloys:				
Scrap	2,777	3,600	2,340	Netherlands 685; West Germany 200; Republic of Korea 100.
Unwrought	79,934	68,685	40,715	NA.
Semimanufactures	13,380	11,470	9,240	Japan 505; Mexico 125; Chile 55.
Platinum-group metals:				
Ore and concentrate troy ounces	324,546	230,260	3,355	United Kingdom 226,905.
Metals including alloys, unwrought and partly wrought do	[r]35,715	30,415	16,718	United Kingdom 7,073; Japan 4,501; West Germany 997.
Selenium, elemental	299	238	141	United Kingdom 41; Netherlands 10.
Silver:				
Ore and concentrate thousand troy ounces	[r]17,707	19,374	5,244	Japan 6,985; Belgium-Luxembourg 3,134; Mexico 1,474.
Metal including alloys, unwrought and partly wrought do	29,415	36,470	36,192	Venezuela 41; Trinidad and Tobago 17; Dominican Republic 13.
Tin: Ore and concentrate	513	664	426	Spain 75; Mexico 71; U.S.S.R. 51.
Uranium and/or thorium: Ore and concentrate value, thousands	$179,384	$358,581	$346,891	United Kingdom $11,690.
Zinc:				
Ore and concentrate	516,209	504,580	5,455	Belgium-Luxembourg 235,955; Japan 92,315; United Kingdom 38,140.
Blue powder	5,656	2,545	2,530	Colombia 3.
Metal including alloys:				
Scrap	28,962	81,115	11,190	Belgium-Luxembourg 25,345; United Kingdom 8,805; U.S.S.R. 8,400.
Unwrought	453,525	518,515	290,355	United Kingdom 49,260; China 23,690; West Germany 13,250.
Semimanufactures	2,622	1,205	1,120	Belgium-Luxembourg 8; France 4; Hong Kong 2.
Other:				
Ores and concentrates	116,810	121,040	11,350	Netherlands 45,460; West Germany 25,560; United Kingdom 19,685.
Oxides and hydroxides	241,817	256,960	252,310	Japan 3,450; United Kingdom 435; West Germany 220.
Ashes and residues	47,591	26,645	17,595	Taiwan 6,470; Japan 1,760; United Kingdom 235.
Base metals including alloys, all forms	1,727	2,625	2,108	United Kingdom 104; Japan 73; West Germany 63.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	332	85	65	Taiwan 15.
Artificial:				
Corundum	157,990	126,270	102,745	United Kingdom 13,485; West Germany 35.
Silicon carbide	67,143	63,800	63,765	Taiwan 35.
Grinding and polishing wheels and stones value, thousands	$3,134	$3,223	$2,191	Finland $144; Japan $141; Venezuela $102.
Asbestos, crude	10	555	61	Japan 494.
Barite and witherite	405	483	470	Japan 6.
Cement thousand tons	1,579	1,931	1,614	Saudi Arabia 315; St. Pierre-Miquelon 2.
Clays, crude	[r]695,630	45,630	45,255	France 190; United Kingdom 165; Portugal 20.
Diamond:				
Gem, not set or strung carats	60,140	NA		
Dust and powder do	[r]13,379	[5]29	23	Australia 6.
Fertilizer materials: Manufactured:				
Ammonia	467,531	572,885	572,885	
Nitrogenous thousand tons	1,349	NA		
Potassic do	10,068	7,960	5,226	Japan 653; India 443; Republic of Korea 340.
Gypsum and plaster do	5,095	5,264	5,264	
Lime	432,844	310,202	309,480	Leeward-Windward Islands 220; Australia 154; Bermuda 114.
Pigments, mineral: Iron oxides and hydroxides, processed	19,017	16,127	12,584	Venezuela 333; Panama 16; Guatemala 14.
Precious and semiprecious stones other than diamond value, thousands	$2,715	$2,854	$1,158	Netherlands $553; Australia $419; Switzerland $210.

See footnotes at end of table.

Table 3.—Canada: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Salt and brine ______ thousand tons__	1,508	1,722	1,718	Leeward-Windward Islands 2; Barbados 1.
Sodium compounds, n.e.s.: Sulfate, manufactured ________________	284,280	405,567	392,317	New Zealand 12,004; Saudi Arabia 1,134; Jamaica 33.
Stone, sand and gravel:				
Dimension stone: Crude and partly worked __________________	127,965	19,112	18,456	Japan 604; Israel 46; Bermuda 5.
Limestone other than dimension thousand tons__	1,758	1,517	1,516	Sweden ([4]).
Quartz and quartzite___________	119,347	65,334	65,315	St. Pierre-Miquelon 19.
Sand and gravel _____________	318,635	168,692	168,179	France 335.
Sulfur:				
Elemental ______ thousand tons__	7,309	6,111	1,132	Australia 467; Morocco 465; Republic of South Africa 453.
Sulfuric acid________________	337,518	286,306	286,285	Trinidad and Tobago 12; Leeward-Windward Islands 9.
Other: Crude ____ value, thousands__	$117,303	$111,560	$28,484	West Germany $34,006; France $19,940; Belgium-Luxembourg $14,481.
MINERAL FUELS AND RELATED MATERIALS				
Coke and semicoke______________	190,879	129,793	126,680	Netherlands 3,113.
Gas, natural_____million cubic feet__	765,882	779,470	779,470	
Petroleum:				
Crude_ thousand 42-gallon barrels__	59,783	76,508	76,508	
Refinery products:				
Liquefied petroleum gas do____	44,063	50,858	47,713	Japan 3,133; Mexico 6.
Gasoline __________do____	3,780	3,373	3,358	St. Pierre-Miquelon 15.
Distillate fuel oil _____do____	11,171	5,748	4,598	Switzerland 588; St. Pierre-Miquelon 310.
Lubricants _________do____	83	115	100	St. Pierre-Miquelon 4; Kenya 3; Australia 1.
Residual fuel oil______do____	13,025	11,266	10,108	United Kingdom 986; Republic of Korea 158; St. Pierre-Miquelon 14.
Asphalt___________do____	1,643	2,136	2,121	Cameroon 8; United Kingdom 2; Dominican Republic 1.
Petroleum coke ______do____	1,100	636	252	Japan 289; Netherlands 52; Australia 42.

[r] Revised. NA Not available.

[1] Table prepared by John G. Panulas.

[2] May include relatively minor quantities of certain shapes not normally included among semimanufactures.

[3] Includes some scrap.

[4] Less than 1/2 unit.

[5] Reflects dust exports only.

Table 4.—Canada: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate thousand tons	2,702	2,836	22	Brazil 1,451; Guinea 841; Guyana 428.
Oxides and hydroxides do	1,021	1,035	105	Jamaica 432; Australia 284; Japan 214.
Metal including alloys:				
Scrap	33,413	40,517	40,322	Jamaica 194.
Unwrought	[r]18,940	28,719	25,001	United Kingdom 1,272; Netherlands 550.
Semimanufactures	122,176	116,035	97,647	Belgium-Luxembourg 6,775; West Germany 5,878.
Antimony: Oxides	936	859	167	United Kingdom 573; Belgium-Luxembourg 119.
Chromium:				
Ore and concentrate	47,625	8,877	1,635	Mozambique 2,697; Republic of South Africa 2,593; Philippines 1,952.
Oxides and hydroxides	1,791	1,280	927	United Kingdom 270; West Germany 24; Netherlands 20.
Copper:				
Ore and concentrate	19,551	13,627	559	Chile 12,467; Peru 136; Republic of South Africa 61.
Sulfate	339	5,001	1,017	West Germany 1,409; Netherlands 1,270; Belgium-Luxembourg 641.
Metal including alloys:				
Scrap	37,973	45,320	[2]43,935	Haiti 106; Dominican Republic 83; Guatemala 57.
Semimanufactures thousand tons	1,236	1,112	519	Chile 10.
Gold:				
Ore and concentrate troy ounces	[r]73,239	14,307	12,286	Republic of Korea 763; Peru 610; Chile 483.
Metal including alloys, unwrought and partly wrought thousand troy ounces	2,220	1,662	1,324	Switzerland 156; Nicaragua 155; Peru 11.
Iron and steel:				
Iron ore and concentrate thousand tons	5,794	3,359	3,359	
Metal:				
Scrap do	835	454	452	Panama 1.
Pig iron, cast iron, related materials	16,735	8,518	8,150	Brazil 315; West Germany 36; France 13.
Ferroalloys:				
Ferrochromium	31,579	21,786	5,958	Republic of South Africa 8,286; Zimbabwe 4,066; Brazil 2,500.
Ferromanganese	36,656	25,087	11,319	Republic of South Africa 11,335; France 1,693; Mexico 541.
Ferrosilicomanganese	12,669	2,877	380	Norway 1,536; Republic of South Africa 960.
Ferrosilicon	18,629	9,860	9,390	Brazil 214; United Kingdom 175.
Unspecified	17,804	4,806	2,925	France 1,082; Brazil 433; United Kingdom 112.
Steel, primary forms	[r]184,158	17,993	6,400	United Kingdom 6,866; France 3,217; Republic of South Africa 1,026.
Semimanufactures:				
Bars, rods, angles, shapes, sections	577,726	219,638	70,972	Japan 37,069; France 37,010.
Universals, plates, sheets	1,717,434	547,510	204,538	Japan 92,282; Republic of South Africa 20,761; France 19,771.
Rails and accessories	37,265	31,726	18,286	United Kingdom 4,745; Belgium-Luxembourg 4,313; Japan 3,724.
Wire	44,494	31,564	10,266	United Kingdom 6,405; France 3,125; Japan 2,384.
Tubes, pipes, fittings	364,804	249,581	85,948	Japan 89,343; Republic of Korea 16,066.
Castings and forgings, rough	118,474	70,149	60,658	United Kingdom 6,023; Italy 920.
Lead:				
Oxides	1,364	926	795	Republic of South Africa 73; Mexico 42; United Kingdom 16.
Metal including alloys, all forms	9,220	9,171	8,131	Belgium-Luxembourg 18; France 5; Spain 5.
Magnesium: Metal including alloys, all forms	[r]468	599	465	United Kingdom 97; Italy 36.
Manganese:				
Ore and concentrate	119,746	78,987	3,482	Gabon 41,685; Brazil 21,975; Republic of South Africa 11,845.
Metal including alloys, all forms	10,371	781	201	Republic of South Africa 430; China 150.

See footnotes at end of table.

Table 4.—Canada: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Mercury 76-pound flasks	1,399	1,679	1,413	Netherlands 153; China 56; Hong Kong 56.
Molybdenum: Oxides and hydroxides	423	212	212	
Nickel:				
Ore and concentrate[3]	23,760	24,642	10,069	Belgium-Luxembourg 6,331; Australia 4,956; Republic of South Africa 2,038.
Metal including alloys:				
Unwrought	2,925	3,922	2,069	Norway 1,767.
Semimanufactures	2,955	2,638	1,376	Sweden 662; West Germany 547.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	22,107	14,853	10,387	United Kingdom 3,566.
Silver: Metal including alloys, unwrought and partly wrought thousand troy ounces	10,524	15,567	8,241	United Kingdom 6,683; Chile 514; Mexico 100.
Tin: Metal including alloys, all forms	3,811	3,905	2,440	Brazil 664; Bolivia 497; Malaysia 231.
Titanium:				
Oxides	4,096	6,324	3,586	West Germany 1,489; Spain 473; Belgium-Luxembourg 328.
Metal including alloys, all forms	552	504	389	Japan 91; United Kingdom 18; Belgium-Luxembourg 3.
Tungsten: Ore and concentrate	^{r}15	8	8	
Zinc:				
Ore and concentrate	41,815	44,329	40,531	Peru 1,315; Republic of South Africa 899; Chile 230.
Oxides	^{r}1,436	1,506	1,332	Netherlands 78; China 59.
Blue powder	223	678	676	West Germany 2.
Metal including alloys:				
Unwrought	4,745	760	756	Switzerland 4.
Semimanufactures	468	561	500	West Germany 42; Belgium-Luxembourg 18.
Zirconium: Metal including alloys, all forms	289	243	190	France 24; United Kingdom 19; West Germany 9.
Other:				
Ores and concentrates	85,772	127,499	74,443	Republic of South Africa 31,499; Australia 17,800; Chile 2,058.
Base metals including alloys, all forms	1,773	1,133	1,043	United Kingdom 33; West Germany 13; Mexico 12.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	42,869	33,624	33,262	West Germany 289; Italy 53; Mexico 20.
Grinding and polishing wheels and stones value, thousands	$20,141	$16,679	$12,155	Italy $1,080; West Germany $934; Austria $687.
Asbestos, crude	934	573	273	Republic of South Africa 300.
Barite and witherite	16,277	23,457	8,558	Ireland 11,500; Italy 3,000; Netherlands 398.
Boron materials: Oxides and acids	6,775	7,870	7,338	U.S.S.R. 239; Italy 167; Argentina 62.
Cement	232,060	255,548	253,282	Japan 1,843; United Kingdom 345; West Germany 34.
Clays, crude:				
Bentonite	311,458	262,426	176,468	Greece 85,958.
Chamotte earth	13,540	5,885	5,885	
Fire clay	49,172	37,009	36,994	West Germany 14.
Kaolin	231,755	227,022	226,239	United Kingdom 783.
Unspecified	142,237	116,687	116,082	United Kingdom 498; France 103; Greece 4.
Cryolite and chiolite	495	4,646	27	Netherlands 4,598; Denmark 21.
Diamond:				
Gem, not set or strung carats	190,833	200,582	39,698	Belgium-Luxembourg 110,408; Israel 26,482; India 11,617.
Industrial thousand carats	1,504	1,091	755	Ireland 222; Belgium-Luxembourg 40; Australia 24.
Diatomite and other infusorial earth	25,544	25,496	25,496	
Fluorspar	173,599	126,596	14,986	Mexico 50,905; Morocco 34,304; Spain 26,401.
Fertilizer materials: Manufactured:				
Nitrogenous	150,979	174,939	152,097	Finland 9,261; Netherlands 7,924.
Phosphatic	306,501	275,387	273,670	Belgium-Luxembourg 993; Israel 201.
Potassic	79,745	87,716	87,713	United Kingdom 3.

See footnotes at end of table.

Table 4.—Canada: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials: Manufactured —Continued				
Unspecified and mixed	89,842	81,683	78,667	Netherlands 2,219; United Kingdom 608.
Gypsum and plaster	143,500	93,844	10,742	Mexico 83,102.
Iodine	181	123	28	Japan 76; Chile 17.
Lime	23,105	17,597	17,496	France 97.
Magnesium compounds	59,018	41,508	37,508	China 3,158; Spain 814.
Mica: Crude including splittings and waste	3,133	3,152	3,151	India 1.
Phosphates, crude thousand tons	3,245	2,512	2,483	Morocco 28.
Pigments, mineral: Iron oxides and hydroxides, processed	8,410	6,814	4,773	West Germany 1,073; Netherlands 588; United Kingdom 186.
Precious and semiprecious stones other than diamond value, thousands	$35,544	$23,193	$7,494	Japan $3,878; France $2,299; Thailand $1,557.
Salt and brine thousand tons	1,255	1,527	993	Mexico 361; Chile 107; Spain 49.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	138,651	134,433	134,296	West Germany 97; United Kingdom 40.
Sulfate, manufactured	12,480	19,061	1,005	United Kingdom 18,056.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	60,081	45,134	22,887	Republic of South Africa 13,251; Italy 6,961; India 1,064.
Worked value, thousands	$5,999	$16,540	$450	Italy $15,731; Republic of South Africa $230.
Dolomite, chiefly refractory-grade	5,121	8,375	8,375	
Limestone other than dimension thousand tons	2,527	1,485	1,485	
Quartz and quartzite	251	241	229	United Kingdom 10.
Silica sand thousand tons	1,143	789	788	
Unspecified do	1,446	1,179	1,172	Sweden 4; West Germany 2.
Sulfur:				
Elemental	4,615	2,159	2,159	
Sulfuric acid	82,494	212,211	81,859	West Germany 82,017; Norway 24,681; Spain 18,700.
Talc, steatite, soapstone, pyrophyllite	30,322	34,522	34,212	Japan 151; Italy 75; United Kingdom 65.
Vermiculite	32,379	24,077	20,031	Republic of South Africa 4,046.
Other: Crude value, thousands	$13,355	$11,566	$9,444	Turkey $1,146; Mexico $291; India $134.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	3,116	2,902	2,882	Trinidad and Tobago 19.
Carbon: Carbon black	9,387	8,273	8,013	United Kingdom 154; France 58.
Coal: All grades including briquets thousand tons	14,703	15,716	15,715	France (4).
Coke and semicoke	[r]500,146	413,724	413,724	
Gas, natural million cubic feet	143	90	90	
Petroleum:				
Crude thousand 42-gallon barrels	[r]193,422	123,725	23,239	Venezuela 40,959; Mexico 20,484; Saudi Arabia 17,695.
Refinery products:				
Liquefied petroleum gas do	7,059	9,263	9,262	France (4).
Gasoline do	579	142	142	
Mineral jelly and wax do	40	776	752	United Kingdom 1.
Kerosine and jet fuel do	564	9	8	Netherlands Antilles (4).
Distillate fuel oil do	534	2	2	
Lubricants do	494	367	362	France 2; United Kingdom 2.
Residual fuel oil do	7,300	9,881	3,732	Venezuela 4,891; Bahamas 812; Colombia 306.
Asphalt do	210	228	227	Greenland (4).
Petroleum coke do	5,147	3,946	3,367	Argentina 517; United Kingdom 62.
Unspecified do	1,044	1,426	571	Belgium-Luxembourg 286; Netherlands 205; Greece 199.

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[r] Revised.

[1] Table prepared by John G. Panulas.

[2] In addition to this amount, 51 metric tons was imported from Puerto Rico.

[3] Quantities also reflect nickel contained in metal scrap.

[4] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—Production of primary aluminum, estimated at 1.1 million tons, was 2.5% higher than in 1982. The Canadian industry was running at over 90% capacity and was scheduled to be operating at 98% capacity by January 1984. Exports of aluminum ingots and other fabricated forms rose by 8% over those of 1982.

Canadian Reynolds Metals Co. Ltd. and Aluminum Co. of Canada Ltd. (ALCAN) were the two companies reported to be producing primary aluminum metal. ALCAN also operated Canada's only alumina refinery at Jonquiere, Quebec. Pechiney Corp. (formerly Pechiney Ugine Kuhlmann) of France signed a letter of intent with the Province of Quebec to construct a 230,000-ton-per-year smelter at Becancour, Quebec, at an estimated cost of $1.5 billion. Pechiney would own two-thirds of the smelter, and Quebec, one-third. The smelter, with an initial capacity of 230,000 tons per year from two potlines of 240 pots each, was scheduled to go on-stream in early 1987 with final installation in 1988. The proposed plant is modular and could eventually produce 345,000 tons per year by installing a third potline. The second of three 57,000-ton-per-year potlines at ALCAN's 171,000-ton-per-year smelter at Grande Baie, Quebec, became operational, and construction of the third potline was completed in 1983. This new smelter, with ALCAN's five other plants, gives the company a total design capacity of about 1.1 million tons per year. Canada, with no bauxite reserves, continued to import all its requirements. Brazil and Guinea were the major sources of bauxite, and Jamaica, Australia, and Japan continued to furnish most of the alumina requirements.

Copper.—Canada ranked as the world's fourth largest copper producer, sharing first place with the Philippines in exports of unrefined copper and ranked fourth in exports of refined copper. Production of primary copper was 624,988 tons, 2% more than in 1982, but not really reversing the decline of the past 10 years. Ninety-five percent of Canada's copper is produced in four Provinces, with the major share from British Columbia, 44%, and Ontario, 29%. Principal producing areas are south-central British Columbia, particularly the Highland Valley, and Sudbury, in north-central Ontario. All major producing areas involve complex multimineral facilities.

In January, Cominco Ltd. commenced production from the Lake Zone ore body at Highland Valley, British Columbia, which was formerly owned by Valley Copper Mines Ltd. and Bethlehem Copper Corp. Annual copper output was expected to be 32,000 tons. The Lake Zone porphyry copper deposit contains an estimated 726 million tons of ore grading 0.475% copper with 0.005% molybdenum values. Teck Corp. resumed operations in May 1983 at the Afton Mine near Kamloops, British Columbia. Production from the Afton Mine was expected to be sold as concentrates, since the company closed its Afton smelter in July for economic reasons.

Westmin Resources Ltd. was continuing with the development of its H-W ore body at the Buttle Mine. The mine and mill were expected to be in production in late 1984 after construction is completed on a new 2,700-ton-per-day concentrator.

Falconbridge Ltd. resumed production at Sudbury, Ontario, in January 1983, after a 6-month shutdown. Inco Ltd. also resumed production in April 1983, after being shut down since May 1982. Production at both operations was at a reduced rate. Hudson Bay Mining and Smelting Co. Ltd. permanently closed down its Whitehorse Mine near Whitehorse, Yukon Territory, because of the decreasing grade of copper ore.

Several mines that were closed in 1982 reopened in 1983, but others remained closed for indefinite periods. It was expected that, unless the price of copper improved, some of the mines that are temporarily closed are unlikely to reopen in the near future and other mines were likely to close.

Gold.—The volume of gold production at an estimated 2.3 million troy ounces increased 9.6% over that of 1982, and most Canadian gold producers reported stronger economic positions than in 1982. According to EMR, at the close of 1983, there were 41 producing lode gold mines operated by 33 companies. There were five mine openings, while three producers closed operations. A number of marginal producers were still in difficulty, and more closures were possible.

Ontario regained first place as Canada's leading gold producer, while Quebec fell back to second place in 1983. The Hemlo deposit on the north shore of Lake Superior near Marathon, Ontario, continued to dominate gold mining activity. Three major companies, Noranda Mines Ltd., Lac Minerals

Ltd., and Teck continued exploration and development on their claims. Noranda expected to have its mine operational in 1984. Reserves of the Hemlo deposit were estimated at 55.6 million tons grading 8.3 grams of gold per ton, and the structure was still considered to be open at depth.

The Detour Lake open pit mine, located about 120 miles northeast of Timmins, Ontario, commenced operations in late 1983. The project is a joint venture operation of Campbell Red Lake Mines Ltd. and Amoco Canada Petroleum Co. Ltd. The mine, reported to be the largest and lowest cost gold producer in Canada, was reportedly capable of producing about 3.5 million ounces of gold, 1.5 million ounces of silver, and 50,000 tons of copper.

Exploration activity for gold was strong throughout most of Canada. Companies that were formerly concerned with base metals concentrated more on gold properties, and work was continued on a number of properties discovered in 1982.

Iron Ore.—The iron ore sector in 1983 continued the series of mine closures, production cutbacks, and layoffs at several iron ore mines and processing facilities in Quebec, Labrador, Ontario, and British Columbia. Depressed steel production in the United States and Western Europe, Canada's major markets, contributed significantly to the severe decline of the past 2 years. There was a large oversupply of iron ore in North America in 1983, and this imbalance was expected to continue in 1984, with more high-cost mines likely to close. Most producers closed from 1 to 3 months in midyear 1983 in an effort to reduce iron ore inventories. Production was estimated at 33.5 million tons compared with 35.4 million tons in 1982. In October, Falconbridge permanently closed the Wesfrob Mine at Tasu, Queen Charlotte Islands, because of depletion of economic reserves. The mine had been in operation since 1967.

Iron and Steel.—Higher consumer demand and low steel inventories initiated the beginning of economic recovery for the steel industry. However, total estimated production of crude steel was 12.8 million tons, which was only slightly better than the 11.8 million tons produced in 1982. Canadian exports of steel totaled 2.6 million tons, a 19% decrease below the 1982 volume.

The international market in steel was a significant issue. The Canadian Antidumping Tribunal found that steel imports were being dumped in Canada and that the domestic industry was injured as a result. The findings were against companies in the European Economic Community, the Republic of Korea, and Japan. Consequently, dumping duties were assessed against these suppliers of carbon steel plate and wide flange beams; stainless steel plate, strip, and bars; and alloy tool steel bars. Also, Canada notified the GATT Committee of its intention to suspend substantially equivalent concessions applied to the trade of certain products from the United States. This was the result of the U.S. decision to impose quotas and additional tariffs on specialty steel for a 4-year period. Import quotas were applied to stainless steel rods and bars and alloy tool steel. Canada's suspension will take the form of surtaxes on the imports from the United States of certain types of stainless steel products.

Lead and Zinc.—The lead and zinc sector was characterized by a sharp decline in production. Overcapacity continues to be a serious problem despite cutbacks and work suspensions at many operations. Higher demand and reduced production resulted in higher prices in the second half of 1983, which improved the situation to a limited degree. Canada produced about 25% of Western World output of zinc. Two companies, Cominco and Noranda, are the world's largest zinc producers and each produces about 10% of market economy countries' supply. Refined zinc production, estimated at 617,000 tons, was up substantially from the 512,000 tons produced in 1982. Zinc mine production, estimated at about 1 million tons, decreased 10% from the 1.2 million tons produced in 1982.

Cominco's new, highly automated zinc electrolytic and melting plant commenced operation in October at Trail, British Columbia. The facility has an annual capacity of 272,000 tons per year. Hudson Bay Mining and Smelting opened its Trout Lake Mine, near Flin Flon, Manitoba. Mine development began in July 1980, and production of 1,600 tons per day was achieved in February 1983.

Nickel.—In much of 1982 and part of 1983, the Canadian nickel industry, normally the world's leading producer, was shut down. Inco and Falconbridge resumed operations in early 1983 operating well below capacity in continuing efforts to reduce inventories. Both companies were implementing extensive cost-reduction programs including improvements in mine productivity, work force rescheduling, and energy conservation.

Canada and Australia have been leading

an attempt to form an intergovernmental organization similar to the International Lead and Zinc Study Group and the International Tin Council to collect and publish nickel statistics and conduct special studies. Published nickel statistics were considered less accurate and complete than for any other major mineral commodity, and many information gaps exist, particularly for consumption, trade, and stocks. The Canadian nickel producers were actively supporting this move as a method for better understanding market conditions. In September 1983, Inco started development on the Thompson open pit mine near Thompson, Manitoba. The $87 million first phase was expected to be completed by 1986. Grade of the ore body is about 2.7% nickel. Development of this mine was expected to enhance Inco's position as a cost-competitive nickel producer.

Silver.—Production of silver declined 16% from 42.2 million troy ounces in 1982 to an estimated 35.6 million troy ounces. With the exception of Equity Silver Mines Ltd. in British Columbia, and Terra Mines Ltd. in the Northwest Territories, silver in Canada was produced as a byproduct of base metal mines. Output from Equity Silver Mines combined with byproduct silver production from other mines in the Province placed British Columbia as the leading silver-producing Province in Canada. Canada continued to be a major producer of silver and ranked third after Mexico and Peru. Canada's main market for silver continued to be the United States, with significant amounts also exported to Japan and Europe.

Other Metals.—More than 15 minor metals were recovered as byproducts of base metals refining. Some examples are antimony, bismuth, cadmium, gallium, germanium, selenium, and tellurium. Tin was limited to recovery at the milling stage, by Cominco at Trail, British Columbia, and Kidd Creek Mines Ltd. at Timmins, Ontario, while rare-earth oxides were recovered as byproducts of uranium mining. Recovery of these metals was related to base metal production and market demand. Cobalt production, at an estimated 1,584 tons, increased 12.8%, compared with that of 1982. The increase was due primarily to resumption of production by the two major nickel producers, Inco and Falconbridge at Sudbury, Ontario. Cobalt was recovered as a byproduct from nickel mining. Inco also commenced production from a new cobalt refinery at Port Colborne, Ontario. The plant has a design capacity of 907 tons per year of electrolytic cobalt rounds. A joint venture, consisting of Falconbridge and Geddes Resources Ltd., continued exploration efforts at the Windy Craggy copper-cobalt deposit near Atlin, British Columbia. The deposit was reported to contain 318 million tons of ore, grading 1.5% copper and 0.08% cobalt. Niobec Inc. reported columbium production of 1,810 tons of columbium pentoxide (Cb_2O_5) from its pyrochlore deposit near St. Honore, Quebec. The company supplied about 15% of the world's columbium requirements. Three primary molybdenum producers, Amax of Canada Ltd., Placer Development Ltd., and Noranda, all in British Columbia, remained closed. Two molybdenum byproduct producers, Lornex Mining Corp. Ltd. and Brenda Mines Ltd., also located in British Columbia, suspended operation temporarily. Molybdenum production was estimated at 10,528 tons, a decline of 25% from that of 1982.

QIT-Fer et Titane Inc. (QIT) was the only company that mined titanium ore in Canada. Ilmenite, a titanium-bearing mineral, was mined from an open pit operation at Havre St. Pierre, Quebec, and the ore was smelted in electric furnaces at Tracy, Quebec. QIT completed construction of an upgrading plant at Tracy in 1983, which would raise the titanium oxide content of the concentrate from 93.5% to 95.5%. QIT could produce a titanium slag grading 80% TiO_2, which would enable QIT to be more competitive.

Canada's only tantalum producer, Tantalum Mining Corp. of Canada Ltd., located at Bernic Lake, Manitoba, remained closed. The mine was expected to remain closed until market conditions improve. Also, Canada Tungsten Mining Corp. Ltd., Canada's largest tungsten producer, remained closed most of the year. The company resumed operations in December at 50% capacity. Construction was completed at the Mount Pleasant Mines Ltd. tungsten-molybdenum mine and mill at Mount Pleasant, New Brunswick. The mine was expected to be operational in early 1984.

NONMETALS

Asbestos.—Asbestos shipments continued to decline. Adverse publicity regarding health hazards, uncertainties about future environmental regulation and shortages of foreign exchange in developing countries continued to have a significant impact on the asbestos industry. Canada accounted for about 20% of world production and 50% of total world exports. Intermittent shutdowns were common in the industry, with some facilities operating at 50% of normal. Production was estimated at 840,000 tons with most of this produced from mines in Quebec.

Potash.—According to EMR, Canadian-installed potash production capacity was 9.2 million tons, of which about 9 million tons was in Saskatchewan and 100,000 tons was in New Brunswick. The largest share of capacity, 41.5%, was held by Potash Corp. of Saskatchewan, a Provincial Crown corporation, followed by International Minerals & Chemical Corp. (Canada) Ltd. with 20.2%. Most companies shut down operations for varying periods of time during the year to control inventories. Two new potash mines began operations during the year. Potash Co. of America (PCA) commenced production in August at its mine near Sussex, New Brunswick. As part of its operation, PCA also intended to recover 440,000 tons per year of byproduct salt. Denison-Potacan Potash Co. announced in February that it would initiate production at the Clover Leaf Mine near Salt Springs, New Brunswick. Canpotex, an offshore marketing agency that handles all sales of Canadian potash to markets outside North America, announced signing of a 3-year extension of a sales agreement to supply potash to Japan. The contract represents about 20% of Canpotex's export sales.

Sulfur.—Canadian production of elemental sulfur from sour natural gas increased slightly. Gulf Canada Resources Inc.'s 1,147-ton-per-day sulfur plant on the Hanlan-Robb Reservoir came on-stream in March. Canada was the world's largest exporter of sulfur, accounting for over 40% of the total world sulfur trade. The world market was very important with exports accounting for 80% of all sales. The United States was the largest customer, consuming just over 1 million tons. Cansulex Ltd., the marketing agency for 19 Canadian sulfur producers, negotiated an interesting sale and barter agreement between the German Democratic Republic and Brazil. Canadian sulfur is sold to an interest in the German Democratic Republic; however, it is shipped to Brazil where goods in kind are shipped from Brazil to the German Democratic Republic to complete the agreement.

Other Nonmetals.—Cement shipments were estimated at 7.8 million tons, down from the 8.4 million tons in 1982. There was concern in the Canadian cement industry regarding a "buy America" clause in a new U.S. Surface Transportation Assistance Act, which funds the upgrading of U.S. highways and infrastructure. It was felt that the industry would feel the effects of this legislation, particularly Canadian companies with clinker grinding plants in the United States. Gypsum production was estimated at almost 7.5 million tons, up 25% over that of 1982. Most gypsum producers in Canada are subsidiaries of U.S. companies, and about 70% of the production was exported to the United States. Canada continued as the world's foremost nepheline syenite producer. Recession in the glass and ceramic industry in the United States impacted Canadian producers since 90% of Canadian exports were usually consigned to the United States. Production of salt from all sources in Canada was 8.6 million tons. Rock salt was produced in New Brunswick, Ontario, and Quebec, while salt from brines was produced in Alberta, Saskatchewan, and Ontario. Mines Seleine Inc., Madeleine Islands, Quebec, completed its first full year of production with output estimated at 600,000 tons. Production was expected to eventually increase to the installed capacity of 1 million tons. Asbury Graphite Quebec Inc. was reported to have resumed operations for a few months. The company is Canada's only producer of graphite from its mine near Notre Dame-du-Laus, Quebec. Production of natural flake graphite was estimated at 2,500 tons, of which 68% was exported to the United States.

MINERAL FUELS

Coal.—Four new mines opened in British Columbia. Westar Mining Ltd.'s Greenhills Mine, Crowsnest Resources Ltd.'s Line Creek Mine, Denison Mines Ltd.'s Quintette Mine, and Teck's Bullmoose Mine came on-stream. Also, Manalta Coal Ltd.'s Gregg River Mine in Alberta started production. Union Oil Co. of Canada Ltd.'s Obed Marsh Mine near Hinton, Alberta, was scheduled to come on-stream in mid-1984. The largest of these coal developments was the $2.5 billion megaproject in British Columbia involving the Quintette Mine and the Bullmoose Mine. The Quintette Mine started production in midyear with a full output of 5 million tons of coking coal and 1 million tons of thermal coal scheduled for 1985. The Bullmoose Mine started production in October 1983 with full production of over 2 million tons of coking and thermal coal planned for 1984. Infrastructure investment costs of about $1 billion were required for new railroads and a new coal terminal.

Almost all coking coal production in Canada was exported. The major customers were Japan, the Republic of Korea, Taiwan, Hong Kong, and Denmark.

Natural Gas.—Canada's natural gas surplus continued to increase because additions to reserves were greater than declining demand. The National Energy Board announced in January that it had found that there was natural gas surplus to Canadian requirements and would allow the export of an additional 11.5 million cubic feet, which would double the volume of natural gas presently committed to the export market. The Canadian natural gas industry, because of the surplus natural gas available, was expected to aggressively pursue the export market particularly in the Midwest and Northeast United States.

The Arctic Pilot Project (APP), a joint venture between Petro-Canada, Nova Corp., Dome Petroleum Ltd., and Melville Shipping Ltd., proposes to liquefy natural gas produced in the eastern Arctic. It would then be shipped via icebreaking tankers down to one of the lower Provinces where it would be regasified and marketed in the United States. APP sponsors were also investigating the possibility of marketing gas in Europe.

Petroleum.—The Federal and Provincial governments were continuing programs initiated in 1982 that were designed to provide tax relief and increase exploration and development. Canada was reported to have a trade surplus in crude oil for the first time since 1975, owing to a 27% reduction in imports and a 41% increase in exports over that of 1982.

Most of Canada's petroleum resources were considered to be in four regions: the western Canada Sedimentary Basin, the eastern Canada offshore region, the Beaufort Sea-Mackenzie Delta region, and the Arctic Islands region. The Geological Survey of Canada (GSC) estimated that conventional oil resources total 37,067 million barrels. GSC ranked the eastern Canada offshore region highest, with an estimated 13,221 million barrels at a 50% probability level. The Beaufort Sea-Mackenzie Delta region second, followed by the western Canada Sedimentary Basin and the Arctic Islands.

Exploration continues at Sable Island off Nova Scotia, Hibernia Field off New Foundland, the Arctic Islands, and the Beaufort Sea. A higher level of exploration activity was continuing in the Provinces. EMR estimated that more than 1,200 exploration and development wells had been completed, compared with 728 wells in 1982.

Uranium.—The uranium market opportunities were limited. Canada had five primary uranium producers operating at yearend. Key Lake Mining Corp.'s Key Lake Mine in northern Saskatchewan came onstream in October. The $500 million uranium mining and milling complex is considered a world class mine. With 700 metric tons per day capacity (producing 12 million pounds of uranium annually), the operation places Canada in the No. 1 position among world producing market economy countries. In 1984, it was expected to account for about 12% of market economy countries' world mine output of uranium. The planned doubling of installed nuclear power capacity in Canada over the next few years continues to stimulate moderate exploration efforts. Production in 1983 was estimated at 8,483 metric tons of uranium oxide (U_3O_8). As of January 1983, uranium export commitments amounted to 60,000 tons of uranium or roughly 10% of the total Canadian uranium reserves.

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[1] For more detailed information on the mineral industry of Canada, see the Canadian Mineral Surveys for 1981 and 1982, both of which were prepared by the Mineral Policy Sector and the Energy Sector, Department of Energy, Mines and Resources, Ottawa, Canada. The U.S. Department of the Interior, Bureau of Mines, has arranged to have these Canadian publications placed in libraries in each of the 50 States and Puerto Rico as follows: University of Alabama, Tuscaloosa; E. E. Rasmuson Library, University of Alaska, Fairbanks; University of Arizona, Tucson; University of Arkansas, Fayetteville; California State Library, Sacramento; A. Lake Library, Colorado School of Mines, Golden; Wilbur Cross Library, University of Connecticut, Storrs; H. M. Morris Library, University of Delaware, Newark; Strozier Library, Florida State Library, Tallahassee; P. Gilbert Memorial Library, Georgia Institute of Technology, Atlanta; University of Hawaii, Hilo; University of Idaho, Moscow; Morris Library, Southern Illinois University, Carbondale; Indiana University, Bloomington; Iowa State University of Science and Technology, Ames; Watson Library, University of Kansas, Lawrence; M. L. King Library, University of Kentucky, Lexington; University of Southwestern Louisiana, Lafayette; R. H. Folger Library, University of Maine, Orono; Eisenhower Library, John Hopkins University, Baltimore, MD; Massachusetts Institute of Technology Library, Cambridge; Michigan Technical Library, Houghton; Wilson Library, University of Minnesota, Minneapolis; University of Southern Mississippi, Hattiesburg; Rolla Library, University of Missouri, Rolla; Montana College of Mineral Science and Technology, Butte; D. L. Love Library, Nebraska Geological Survey at University of Nebraska, Lincoln; University of Nevada, Reno; University of New Hampshire, Durham; J. C. Dana Library, Rutgers University, Newark, NJ; New Mexico Institute of Mining and Technology, Socorro; Columbia University, New York; D. H. Hill Library, North Carolina State University, Raleigh; Frity Library, University of North Dakota, Grand Forks; Ohio State University, Columbus; University of Oklahoma, Norman; Multnomah County Library, Portland, OR; Pennsylvania State University, University Park; University of Rhode Island, Kingston; University of South Carolina Undergraduate Library, The Horseshoe, Columbia; South Dakota School of Mines and Technology, Rapid City; Tennessee State Library and Archives, Nashville; Main Library, University of Texas, Austin; Marriott Library, University of Utah, Salt Lake City; Bailey Library, University of Vermont, Burlington; Virginia Polytechnic Institute, Blacksburg; University of Washington, Seattle; West Virginia University, Morgantown; Memorial Library, University of Wisconsin, Madison; University of Wyoming, Laramie; and University of Puerto Rico, Mayaguez.

[2] Physical scientist, Division of Foreign Data.

[3] Where necessary, values have been converted from Canadian dollars (CAN$) to U.S. dollars at the rate of CAN$1.2324=US$1.00, the average exchange rate for 1983.

The Mineral Industry of Chile

By Pablo Velasco[1]

Despite a severely depressed world economy, Chile's economy achieved a small amount of growth, and Chile maintained its position as the world's leading copper producer for the second year in a row. Chile also became the world's largest molybdenum producer and retained its place as number two in world iodine output. In addition, Chile was a significant producer and exporter of iron ore, pig iron, crude steel, lead, manganese, silver, gold, cement, nitrates, and coal.

Among specific new mineral developments, the construction of a new lithium carbonate facility was completed in the northern part of the country with a capacity of 14 million pounds of lithium carbonate per year. The operating company, Sociedad Chilena de Litio Ltda. (SCL) was formed in 1980 jointly between Corporación de Fomento de la Producción (CORFO), a Chilean Government development company that owns 45%, and Foote Mineral Co. of the United States, with 55% ownership.

Another new development was initiated by Empresa Nacional de Minería (ENAMI), a Government-owned company, in an attempt to create new jobs and reactivate the depressed Chilean economy. ENAMI opened 12 new gold placer mines in several regions of the country and anticipated expanding to a total of 59 in the future.

In November, Sociedad Contractual Minera el Toqui Ltda., a private company, opened El Toqui, a 750-ton-per-day polymetallic mine in the southern part of the country. The deposit contains significant amounts of cadmium, copper, gold, lead, silver, and zinc.

The mineral industry of Chile contributed about 9% in real terms to the gross domestic product (GDP) and 59.9% of the total mineral exports with copper representing 80% of the mineral exports.

The mineral sector showed production increases over 1982 figures in copper, 1.2%; gold, 5%; lead, 8.2%; manganese, 61.6%; silver, 22.5%; cement, 11.3%; iodine, 7.6%; sodium nitrate, 11.8%; sodium sulfate, 7.9%; talc, 125%; coal, 8.1%; and refined petroleum products, 11%. There were decreased outputs of iron ore and concentrate, 10.9%; molybdenum, 23.9%; sulfur, 15%; natural gas, 5.2%; and petroleum, 8.1%; all relative to 1982 figures.

The Corporación Nacional del Cobre de Chile (CODELCO-Chile), the largest copper producer in the world, maintained its production level in 1983. CODELCO-Chile has the lowest average cost of production of the world's major copper producers at about 45 cents per pound of copper. Chile is also the principal world producer and exporter of molybdenum, surpassing the United States in 1983.

In December, CODELCO-Chile announced plans for investment projects amounting to $2 billion over the next 5 years. The $400 million annual investment is aimed at maintaining current production levels despite decreasing ore grades. Most projects are for the Chuquicamata Mine. A $670 million Inter-American Development Bank (IDB) loan package was approved earlier in the year for financing the new projects.

Plans call for a 14% increase in copper mine capacity at Chuquicamata and El Teniente that is to be financed by a 15-year, 11% loan from the IDB. IDB will provide $268 million and also act as the lead bank for further complementary credits and loans from commercial banks up to a total of $536 million. CODELCO-Chile is to raise $85 million from its own funds while supplier credit of $49 million will bring the total financing package up to $670 million. These expenditures will increase copper capacity at the Chuquicamata and El Teniente Mines by 142,000 tons per year. In 1983, CODELCO-Chile produced over 1 million tons of copper from Chile's total output of almost 1.26 million tons.

In January, the Chilean Government and the International Monetary Fund (IMF) reached an agreement on a 2-year standby program to provide $550 million in IMF credits and a compensatory financing facility of about $325 million. In return, Chile agreed to performance requirements for 1983 and 1984. The standby program assures commercial bank lenders that Chile is following a disciplined macroeconomic adjustment program.

In 1983, the GDP declined by 0.8% below 1982 levels. This follows the dramatic 14.3% decline in 1982, and the boom years of 1976-81, in which the GDP grew at an average of 7.2% per year. This was equivalent to a level of Ch$326.6 billion in 1977 Chilean pesos.[2] Foreign reserves totaled $1.9 billion at yearend 1983, a $604 million reduction below that of 1982. This amount is within the provisions of the standby program agreed to with the IMF.

A trade surplus of $1.01 billion was recorded as exports rose 4% and imports declined 22%, relative to 1982 figures. The balance-of-payments deficit totaled $540.9 million compared with a $1.16 billion deficit in 1982. The consumer price index rose by 23.1% compared with 20.7% in 1982.

The country's total foreign debt (in 1983 dollars) amounted to almost $17.5 billion, a 1.8% increase over that of 1982. There were 148 applications for investment for a total of $328 million, which were approved by the Foreign Investment Committee. Actual investment that entered the country totaled $183 million during the year. Since the enactment of Chile's Foreign Investment Law No. 600 in 1977, a total of 871 projects from 43 countries have been approved for investments totaling $7.3 billion. Actual investments have been $2.0 billion and 50.8% were from the United States. The large difference between approved and actual investment is due primarily to depressed mineral prices and the length of time it takes for large mining projects to complete the exploration and the design stage before a final investment decision can be made. Mining projects accounted for 41%; industrial projects, 24.2%; services, 27%; and construction, 4.7%.

The two most significant incentives to foreign investment during 1983 were the introduction of the new Mining Code to implement the 1981 organic law, and the signing of a bilateral investment insurance agreement between Chile and the United States. This will permit the U.S. Overseas Private Investment Corp. to provide insurance coverage to U.S. investors that wish to make new investments in Chile. A few opposition politicians have criticized the terms of the Mining Code; however, Chile's extensive mineral resources still remain attractive to potential investors.

Government Policies and Programs.—On October 14, a new Chilean Mining Code (Law No. 18,248) was released. It became effective on December 13. This event was unusually important because it implies the start of the enforcement of the Constitutional Organic Law No. 18,097 on mining concessions issued in January 1982. Further, this was the first change in the mining law since 1932. The new mining code specifies the details concerning exploration and exploitation concessions. It defines the state as owner of all mines, but upholds the right of all persons to search for and work the country's mineral deposits. National interests require a restriction on Government officials and members of their immediate family in obtaining and holding mining concessions. Domestic and foreign investors will receive the same protection under the law. Exploration concession will be granted for a period of 2 years, renewable for an additional 2-year period. Exploitation concessions will not have a fixed period and will be subject to payment of an annual license fee. The Mining Code has special exemption provisions for hydrocarbons, lithium, uranium, and thorium, and contains details concerning ownership, concession size, timetables, procedures for establishing property value, privileges, and obligations of the concessionaire.

PRODUCTION

Copper dominates Chile's mining sector. In recent years, Chilean mines have reduced local operating costs, increased production, and expanded exports. Chile has somewhat over one-quarter of the Western World's resources of copper with an average grade of 0.94%. Production of fine copper during 1983 was 1,257,100 tons, of which

CODELCO-Chile produced over 80%. CODELCO-Chile's reserves amount to almost 80% of the country's total copper reserves and 21% of the Western World reserves with an average grade of 0.93% copper. The reserves of molybdenum associated with the copper minerals amount to 2.67 million tons of contained fine molybdenum, roughly 30% of the world reserves. Gold and silver production continued to grow, and several companies were exploring for new deposits.

SCL completed construction of its lithium project in the Atacama Desert. Initial production was scheduled for April 1984. These lithium resources were estimated to be 40% to 50% of the world's total. Petroleum production was 14.4 million barrels, an 8.1% decrease compared with that of 1982, which accounted for just under one-half of domestic consumption. Empresa Nacional del Petróleo (ENAP) has offered to sell natural gas from the Strait of Magellan at the rate of 7.7 million cubic meters per day for 15 years and is close to signing separate contracts for a methanol plant and an ammonia-urea plant. Coal production by the national coal company increased 8.1% compared with that of 1982.

During the year, Sociedad Contractual began production of copper, gold, lead, silver, and zinc at its El Toqui Mine at the production rate of 270,000 tons of ore per year. The entire output of lead and zinc concentrates will be exported to Japan, the Republic of Korea, Taiwan, and the United States.

Table 1.—Chile: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Copper:					
Mine output, metal content[3]	1,062,700	1,067,900	1,081,100	1,242,200	1,257,100
Metal:					
Smelter, primary[4]	948,900	953,100	953,800	1,046,800	1,058,100
Refined:[5]					
Fire, primary refined	161,800	147,100	140,600	153,288	150,000
Electrolytic	[r]618,300	663,600	635,000	699,212	683,400
Total	[r]780,100	810,700	775,600	852,500	833,400
Gold, mine output, metal content troy ounces	111,405	219,773	400,479	543,569	570,971
Iron and steel:					
Ore and concentrate:					
Gross weight thousand tons	[r]7,118	[r]8,589	7,733	5,806	5,174
Iron content[e] do	[r]4,385	[r]5,291	[r]4,764	[r]3,576	3,120
Pig iron do	611	648	582	454	538
Ferroalloys:					
Ferromanganese	5,221	5,684	5,254	2,982	3,000
Silicomanganese	256	219	104	--	100
Ferrosilicon	5,063	5,385	2,477	1,413	1,400
Other	892	515	656	1,456	1,400
Total	11,432	11,803	8,491	5,851	5,900
Steel, crude[6] thousand tons	657	704	644	492	611
Semimanufactures (hot-rolled) do	422	516	495	233	473
Lead, mine output, metal content	252	315	223	1,552	1,679
Manganese ore and concentrate	24,969	27,701	25,557	16,111	26,050
Molybdenum, mine output, metal content	13,559	13,668	15,360	20,048	15,264
Rhenium, mine output, metal content, in pounds of metal[e]	4,500	8,500	10,300	10,000	7,000
Selenium kilograms	38,950	17,100	33,665	23,011	43,869
Silver thousand troy ounces	8,740	9,598	11,610	12,288	15,055
Vanadium, mine output, metal content[e] [7]	450	272	127	--	--
Zinc, mine output, metal content	1,847	1,134	1,516	5,656	5,993
NONMETALS					
Barite	226,767	225,529	259,349	292,402	114,486
Borates, crude, natural (ulexite)	3,049	3,275	3,277	291	1,301
Cement, hydraulic thousand tons	[r]1,357	1,583	1,863	1,132	1,260
Clays:					
Kaolin	59,222	59,452	56,778	21,086	40,812
Other (unspecified)	129,829	158,391	178,128	34,842	31,876
Diatomite	763	1,147	358	387	741
Feldspar	133	2,150	2,506	469	2,356
Gypsum:					
Crude	162,482	198,115	237,853	89,636	66,337
Calcined	54,917	74,435	103,344	41,304	53,425
Iodine, elemental	2,410	2,601	2,688	2,596	2,793
Lime, hydraulic[e] thousand tons	789	778	648	[r]645	650

See footnotes at end of table.

Table 1.—Chile: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Nitrogen: Natural crude nitrates:					
Sodium	467,200	440,000	471,170	420,750	470,513
Potassium-enriched	154,100	180,400	153,230	156,000	152,000
Phosphates: Guano	--	--	1,100	1,427	1,064
Pigments, mineral, natural: Iron oxide	2,590	4,451	4,890	2,445	6,791
Potash, K_2O equivalent	21,600	25,300	21,400	21,800	22,100
Pumice (includes pozzolan)	220,088	249,805	277,359	172,382	173,789
Quartz, common	141,079	162,663	165,393	185,556	221,757
Salt, all types	589,845	441,105	290,279	674,002	711,893
Sodium compounds:					
Sodium carbonate[e]	10,800	10,800	10,000	NA	NA
Sodium sulfate[8]	70,427	71,315	58,677	48,146	51,943
Stone:					
Limestone thousand tons	2,300	2,766	2,923	1,665	2,131
Marble	3,882	2,505	1,879	963	1,200
Sulfur:					
Native, other than Frasch:					
Refined	11,605	13,925	4,659	6,615	15,688
Caliche	65,290	73,510	109,965	98,372	68,204
Byproduct (from industrial gases)	27,287	[e]26,700	28,000	31,828	32,364
Total	104,182	114,135	142,624	136,815	116,256
Talc	850	1,139	665	283	637
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous and lignite thousand tons	957	1,024	1,169	997	1,078
Coke:					
Coke oven do.	270	[r]286	300	242	250
Gashouse[e] do.	5	NA	NA	NA	NA
Gas, natural:					
Gross million cubic feet	[r]202,441	[r]190,545	179,367	178,850	169,609
Marketed do.	138,094	[e]135,000	130,000	124,661	126,000
Natural gas liquids:					
Condensate thousand 42-gallon barrels	674	[e]650	NA	NA	NA
Natural gasoline do.	1,200	937	931	969	934
Liquefied petroleum gas do.	2,971	2,717	2,849	2,893	2,855
Total do.	4,845	4,304	3,780	3,862	3,789
Petroleum:					
Crude do.	7,561	12,159	15,104	15,626	14,363
Refinery products:					
Gasoline:					
Aviation do.	151	[r]25	44	101	94
Motor do.	8,919	[r]8,290	8,806	7,146	8,026
Jet fuel do.	1,258	[r]1,226	1,510	1,145	1,126
Kerosine do.	2,025	[r]1,799	1,662	633	1,336
Distillate fuel oil do.	8,724	[r]8,839	7,874	6,122	7,849
Residual fuel oil do.	10,900	[r]10,617	9,158	6,321	6,391
Liquefied petroleum gas do.	2,718	2,887	2,641	2,051	2,208
Unspecified do.	1,277	[r]2,489	1,902	2,866	3,688
Refinery fuel and losses do.	837	[r]277	1,857	1,280	--
Total do.	36,809	[r]36,449	35,454	27,665	30,718

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1] Table includes data available through Aug. 6, 1984.

[2] In addition to the commodities listed, pyrite is also produced, but available information is inadequate to make reliable estimates of output levels.

[3] Figures are the nonduplicate copper content of ore, concentrates, cemented copper, slags and minerals, copper as a byproduct of gold and silver precipitate, and other copper-bearing products measured at the last stage of processing as reported in available sources.

[4] Figures are total blister, fire refined, electrolytic and equivalent copper output including that blister subsequently refined in Chile and copper produced by electrowinning. Detailed statistics on electrowinning are not available, although based on current plant capacities, electrowon copper production is estimated to be approximately 55 metric tons per year.

[5] Figures are total refined copper distributed into two classes according to method of refining, fire refined and electrolytic, which includes electrowinning copper refined in Chile.

[6] Excludes castings.

[7] Estimated on the basis of reported vanadium content of vanadiferous slags imported by the United States from Chile.

[8] Includes natural sodium sulfate and anhydrous sodium sulfate, coproducts of the nitrate industry.

TRADE

Chile's terms of trade since 1970 have deteriorated more than any other country in Latin America. First, this was due to the decline in real copper prices, which for the past 2 years have been at their most depressed real levels since the Depression. Second, the oil price increases since 1973 have hurt Chile's trade account seriously. Despite these adverse factors, Chile achieved a trade surplus in 1983 of $1,014 million, which is up sharply from the $63 million surplus in 1982. Total exports were $3,851 million, up 3.9% from those of 1982. In general, export volumes were up and prices were down owing to the devaluation of the Chilean peso and the need for foreign exchange earnings. Imports equaled $2,837 million, down 22.1% from those of 1982. Lower imports were due to the recession and to the increase in the tariff level from 10% to 20%. Mineral exports reached $2.3 billion, almost 60% of the total exports and increased only 1.3% over that of 1982.

The value of copper exports was up 6% over that of 1982 and accounted for 47.9% of total exports. Other important increases in mineral exports were gold and silver ores, 6.3%; silver, 5.0%; iron ore pellets, 27.2%; and iron ore in bulk, 33.6%; all relative to 1982 exports. Molybdenum concentrate exports declined 72.4% in 1983 compared with that of 1982.

The United States was Chile's largest copper export market, receiving 28% of total copper exports valued at $540.7 million, up 52.8% over those of 1982. Imports from the United States, Chile's main trading partner, reached $672 million, which were 23.7% of the value of total Chilean imports, down 22.1% from those of 1982. Exports to the United States were $1,086 million, 28.2% of the total export value and up 35.6% over those of 1982. Chile's main importance to the United States and world markets is copper exports. For a number of years Chile has been supplying increasing shares of U.S. refined copper. In 1983, Chile provided 13.8% of the total U.S. imports of refined copper.

Table 2.—Chile: Exports of copper and molybdenum ore, by commodity and country[1]

(Metric tons)

Commodity and country of destination	1983
Copper:	
Ore and concentrate, copper content:	
Belgium	1,100
Brazil	29,000
Canada	22,600
China	2,100
Finland	13,000
Germany, Federal Republic of	2,300
Japan	78,600
Korea, Republic of	13,400
Netherlands	400
Spain	1,000
Sweden	7,400
Switzerland	3,800
Taiwan	4,600
United Kingdom	3,700
United States	2,200
Total	185,200
Blister:	
Austria	400
Belgium	12,200
Brazil	2,200
China	12,900
German Democratic Republic	3,000
Germany, Federal Republic of	22,300
Italy	2,700
Japan	5,500
Korea, Republic of	2,000
Netherlands	4,000
Romania	6,000
Spain	22,300
Taiwan	700
Turkey	18,100
United Kingdom	25,500
United States	79,600
Yugoslavia	5,000
Total	224,400

See footnotes at end of table.

Table 2.—Chile: Exports of copper and molybdenum ore, by commodity and country[1]—Continued

(Metric tons)

Commodity and country of destination	1983
Copper—Continued	
Refined:	
Argentina	31,600
Belgium	5,600
Brazil	31,100
Canada	7,000
China	40,500
Colombia	200
France	84,600
German Democratic Republic	7,200
Germany, Federal Republic of	127,500
Greece	7,100
Italy	88,800
Japan	31,600
Korea, Republic of	5,200
Netherlands	40,600
Spain	16,600
Sweden	13,600
Switzerland	900
Taiwan	1,300
United Kingdom	22,500
United States	266,300
Yugoslavia	500
Total	830,300
Molybdenum: Ore and concentrate, molybdenum content	3,830

[1] Table prepared by John G. Panulas.

Source: Estadisticas del Cobre, Boletin No. 2, Mar. 1984, Comisión Chilena del Cobre.

COMMODITY REVIEW

METALS

Copper.—Copper production increased 1.2% over that of 1982, which was another record level; 1983 was the eighth consecutive year with output more than 1 million tons. This was Chile's second year as the world's largest primary copper producer; with an output of 1,257,100 tons, it surpassed both the United States and the U.S.S.R. CODELCO-Chile was the dominant copper producer and provided 80.5% of the total output, followed by the medium and small mining sector with 19.5%. CODELCO-Chile's total output of 1,012,055 tons was divided as follows among its divisions: Chuquicamata, 55%; El Teniente, 30%; El Salvador, 9%; and Andina, 6%.

The most important producer of copper in the medium and small sector of the Chilean mining industry was the Government-owned enterprise, ENAMI, followed by Cía. Minera Disputada de las Condes S.A., a private consortium owned by Exxon Minerals Co. and Empresa Minera Mantos Blancos S.A. CODELCO-Chile's gross income was over $1.56 billion and the net profit was $220.7 million, compared with $160.6 million in 1982.

During the year, $27 million was spent as part of a $96 million program to expand the Chuquicamata division's concentrator capacity to 51,000 tons per day. The smelting capacity will also be increased with the addition of a flash furnace and a pollution control device to trap all gases from the smelter, and a new sulfuric acid plant will be built to provide acid for leaching programs. Also, $70 million was spent to replace generator units. The Andina division completed its $28 million concentrator expansion program, which increased its capacity to 20,000 tons per day from 14,000 tons per day. El Salvador division plans to expend $6 million in expansion of its electrolytic refinery to 96,500 tons per year from 80,000 tons per year.

Finally, El Teniente division spent $14 million during the year in modernization of its transportation and tailings disposal systems as part of a $159 million investment program. El Teniente also plans to spend $12 million on a project to recover copper in solution existing in the drainage waters from the mine by an electrowinning process, and $56 million to expand the Colón concentrator's capacity to 41,500 tons per day from 26,500 tons per day.

Among private sector copper projects, Utah International Inc.'s La Escondida deposit is the most important. Discovered in 1981, this large deposit is undergoing extensive development and bulk sampling for mill design. Current plans call for a $1.5 billion investment to develop an open pit with 545 million tons of ore averaging 2.16% copper. Present plans anticipate an annual output of 200,000 tons of fine copper.

ENAMI recently announced that it was suspending until further notice a tender for the Andacollo copper deposit, which has estimated reserves of 250 million tons of ore assaying 0.62% copper. The decision to suspend the tender has been attributed to poor economic conditions.

Another major, $1.5 billion copper project under earlier consideration for development was Atlantic Richfield Co.'s (ARCO) Los Pelambres deposit containing an estimated 428 million tons grading 0.78% copper and 0.03% molybdenum. In June, ARCO announced the indefinite postponing of its development until additional financing sources could be found.

Other potential copper deposits that are still under planning stages or under exploration are the Quebrada Blanca owned by ENAMI (49%) and Superior Oil Co., Falconbridge Nickel Mines Ltd., Falconbridge Ltd., Canadian Superior Oil Ltd., and McIntyre Mines Nevada Ltd. (51%); Cerro Colorado, wholly owned by Rio Algón Ltd., a Canadian subsidiary of Rio Tinto Zinc Corp. Ltd.; El Abra owned by CODELCO-Chile and five Brazilian companies; and the Mocha copper deposit, which was explored recently by Continental Oil Co. with an authorized budget of $15 million.

Iron Ore.—Output was almost 5.2 million tons, 10.9% below that of 1982. Production of iron ore pellets, shipped mainly to Japan, also declined to 3 million tons, 10% below the 1982 figure. However, the dominant producer, CAP, reported an increase in domestic iron ore sales of about one-fourth to almost 1 million tons. CAP also reported a $5.1 million profit, contrasted with earlier large losses. CAP has a 10-year iron ore sales contract, which began in 1978, with Japanese firms (including Mitsubishi Corp. and Marubeni Corp). Deliveries for 1983 were over 5 million tons, of which 2.6 million tons were pellets.

Iron and Steel.—Pig iron, crude steel, and semimanufactured (hot-rolled) steel production increased 18.5%, 24.2%, and 103%, respectively, over that of 1982. Profits of $11.5 million were earned by Compañía Siderúrgica de Huachipato S.A., a CAP subsidiary, because of an increase in domestic sales and a successful cost-reduction program. This contrasted with losses of $44.3 million in 1982.

Manganese.—All mine production comes from small deposits located about 368 kilometers north of Valparaiso in the Coquimbo Province. The dominant producer is Manganesos Atacama S.A., a Compañía de Acero del Pacífico S.A. (CAP) subsidiary, which operates small mines and a processing plant at Coquimbo. Production of manganese ore and concentrate increased 61.6% in 1983 compared with that of 1982, one-half of which went to domestic markets and the other one-half went to the Guayancán plant for further conversion into manganese dioxide and ferromanganese for export production.

Molybdenum.—CODELCO-Chile produced molybdenum as a byproduct of its copper output. In 1982, a record output level was reached at slightly over 20,000 tons. In 1983, output declined about one-fourth due to lower ore grade at the Chuquicamata division, the principal producer. Molybdenum sales were 16,742 tons of concentrate valued at $133.3 million. CODELCO-Chile reportedly converted two-thirds of the molybdenum concentrate to oxide. The remaining concentrate is processed by Molybdenos y Metales S.A. (Molymet) in Chile and additional international firms under toll conversion contracts. Molymet, which is also the largest producer of rhenium in the world, was reported to have exported 30% of the world's rhenium supply in 1983.

Precious Metals.—Chile's gold and silver output increased 5% and 22.5%, respectively, over that of 1982. Until 1979, most of Chile's gold production was a byproduct of the copper industry. However, in recent years, with the opening of the El Indio gold mine, almost 80% of the gold output comes from actual gold mines. There are extensive placer deposits throughout Chile and many of them are being mined. To expand employment, the Chilean Government through ENAMI has opened 12 gold placers throughout Chile and plans to open 59 additional placer deposits. Workers will receive equipment, a minimum wage, and technical assistance. The program could create work for 7,500 persons.

El Indio Mine, the largest private gold

and silver producer, operated by Cía. Minera San José Ltda., sold 362,000 troy ounces of gold and 926,000 troy ounces of silver in 1983. Ore reserves at El Indio were estimated at 5 million tons averaging 0.3 troy ounce of gold per ton. Present mine and mill capacity is 1,550 tons per day with an expansion underway to 1,700 tons per day to be finished in 1984. El Indio is 82% owned by the U.S. firm St. Joe International Corp., and Chilean investors. Opened first in 1979 with direct shipping ore that averages about 6.8 troy ounces of gold per ton, a mill and a roaster plant were opened in 1981. The entire area around El Indio is being extensively explored. There is a 160-kilometer zone of hydrothermal alternation along which the exploration program is being conducted. Six exploration camps were located in these zones: Nevada, San Carrón, Libra, Tambo, La Laguna, and Coipita; Tambo, where St. Joe holds an 82% share, is the most promising.

A new polymetallic mineral operation, El Toqui, which produces gold, silver, lead, zinc, and cadmium, was opened in November in southern Chile, 120 kilometers north of Coihaique Province. The operating company, Sociedad Contractual, invested $30 million to develop the 750-ton-per-day concentration plant fed by two underground mines. The same firm is also investigating a significant gold and copper discovery at Katerfeld, about 29 kilometers from the new minesite.

NONMETALS

Cement.—Chile's cement production rose 11.3% over that of 1982 to almost 1.3 million tons. Despite a depressed construction industry with over 50% idle capacity, there were two important plant expansions. Both the Cemento Cerro Blanco de Polpaico S.A. and Cemento el Melón S.A., a subsidiary of the British-owned Blue Circle Industries Ltd., recently finished expansion plans, increasing their production capacity to 1.5 million tons per year and 1.3 million tons per year, respectively. Both companies hope that such investment will allow them to meet future expanded needs. Another producer, Industria Nacional de Cemento S.A., is also expanding production capacity from 230,000 to 300,000 tons per year at its Talcahuano plant. The installation of a new F. L. Smidth grinding line is scheduled for yearend 1984. Industria Nacional de Cemento also is considering a kiln transformation to raise plant capacity to 400,000 tons per year.

Lithium.—Initial agreements were signed between Foote Mineral of the United States and the Chilean Government in 1975 to develop the Chilean lithium deposits if the feasibility study was successful, which it was. Therefore, in August 1980, Foote Mineral, along with CORFO, the Chilean Government's development company, formed SCL. SCL is 55% owned by Foote Mineral and 45% by CORFO. Construction of a lithium carbonate plant was begun in 1982 and was completed in late 1983.

In April 1984, the $48 million facility located at La Negra near the port city of Antofagasta is scheduled to begin processing concentrated brine, rich in lithium carbonate, sodium, potassium, and magnesium chloride, from the Salar de Atacama. It will initially produce 6 million pounds of lithium carbonate in 1984 and is expected to reach the design capacity of 14 million pounds in 1985. Chile's lithium resources are extensive and amount to almost 40% of the world's known resources.

Nitrates.—Output of nitrates and related products all increased over that of 1982. Actual production increases were natural crude nitrates, 7.9%; sodium nitrate, 11.8%; iodine, 7.6%; and sodium sulfate, 7.9%. The single domestic producer, Sociedad Química y Minera de Chile S.A., the Chilean chemical and mining company, operated two large plants at Pedro de Valdivia and María Elena Coya Sur and has adequate reserves for 50 years at current output levels. In March 1983, the U.S. International Trade Commission ruled that imports of Chilean industrial-grade sodium nitrate had injured the Olin Corp. and duties of $39.08 per ton were levied on Chilean imports of this commodity. Agricultural-grade sodium nitrate was unaffected.

Other Nonmetals.—CORFO has issued an invitation for international tenders to be presented for studies, mining claims, and other rights for the production of potassium salts and boric acid. The deposits are located in the Salar de Atacama, which currently have been developed for a lithium operation in conjunction with Foote Mineral. The salt flats cover an area of about 3,000 square kilometers in Antofagasta Province. The Comité de Sales Mixtas (CSM) of CORFO started a feasibility study on the production of various chemicals from the salt flats in 1975. That study has now been completed and includes identification of available reserves, the feasibility of solar evaporation pools, evaluation of the required chemical processes, determination of the necessary infrastructure, and the location of clay deposits to supply material for lining the evaporation pools. The mineral reserves delineated and market studies have indicated that a large industrial complex could be established, and it was estimated that it would require an investment of about $150 million. It was envisaged that an operation producing 500,000 tons per year of potassium chloride, 150,000 tons of potassium sulfate, and 30,000 tons of boric acid could be sustained. Almost all the output would be exported, and the CSM study indicated that this would generate returns of about $90 million annually.

MINERAL FUELS

Coal.—Chile's output of coal was over 1 million tons, up 8.1% over that of 1982. Practically all of Chile's coal output comes from the Bío-Bío area. The largest producer Empresa Nacional del Carbón S.A. (ENACAR), is a state corporation that controls the Lota Mine and three other small mines (the Arauco Mines). The second largest producer is the Schwager Mine, now a private company. A British firm, Northern Strip Mining Ltd., has joined with Compañía de Petróleos de Chile S.A. to form Compañía de Carbones de Chile Ltda. (COCAR) to exploit the 100-million-ton Pecket subbituminous coal deposits of south Chile near Punta Arenas and the Strait of Magellan. However, owing to weak domestic markets, the COCAR plan to strip mine 1 million tons per year has not progressed.

In a joint effort to decrease oil imports, ENACAR and CODELCO-Chile agreed to increase deliveries of coal to Chuquicamata's thermopowerplant to 100,000 tons per year from 40,000 tons per year, which could save CODELCO-Chile about $6 million annually.

Petroleum and Natural Gas.—ENAP, the country's only producer of crude oil, has managed to maintain production levels near those attained in the record years of 1981 and 1982.

Production of crude oil declined 8.1% relative to 1982 to 14.4 million barrels, but still was substantially higher than the average for 1974-80. The reason for the decline was the near exhaustion of four of the largest deposits (Spiteful 2, 3, 4, and 5). However, several other deposits increased their production enough to compensate for these declines. Output from offshore operations fell for the first time since they began in 1979, but they still account for 73% of ENAP's total output. ENAP has 21 platforms, 18 of which are in full production; the platforms provide almost 75% of total output with the balance coming from inland wells. The offshore area in the northeastern half of the Strait of Magellan still has the largest reserves for future production.

Table 3.—Chile: Production of crude oil, by area

(Thousand 42-gallon barrels unless otherwise specified)

Area	1979	1980	1981	1982	1983
Tierra del Fuego	2,280	1,825	1,472	1,474	1,454
On land	3,161	2,752	2,578	[r]2,403	2,356
Offshore	2,120	7,582	11,054	11,749	10,553
Total	7,561	12,159	15,104	[r]15,626	14,363
Percent offshore	28	62	73	75	73

[r] Revised.

Source: Empresa Nacional del Petróleo.

The production from existing fields in the Strait of Magellan has peaked, although ENAP hopes to avoid a sharp decline in output by using secondary recovery methods and drilling new wells from platforms now in production. Both techniques have been successful in pilot tests. ENAP is stressing new developments and has decided to continue to invest $125 million per year in exploration. ENAP will shift its exploration emphasis away from the Strait of Magellan, with the exception of deeper drilling around the edges of the known fields. ENAP hopes to avert the severe drop in production that will occur in about 3 years as existing oilfields are exhausted.

ENAP's output of 14.4 million barrels of petroleum and 169.6 billion cubic feet of natural gas (of which 69% was reinjected) presently supplies about 51% of domestic petroleum demand. This figure is misleading, according to ENAP's officials, because the current demand is severely depressed by the economic recession. Under normal conditions or in the event of an economic recovery, ENAP would be able to meet only 20% of demand. The current value of oil imports is about $540 million, and imports were up 55.0% over those of 1982. Sources in 1983 were Latin American countries, 61.4%; the Middle East, 32.4%; and Africa, 6.2%.

Production of natural gas declined 5.2% below that of 1982. All natural gas deposits are located in the Strait of Magellan. Total reserves were estimated at 1.5 billion cubic meters. Gas production from the fields is piped to either Cullen on the island of Tierra del Fuego where ENAP's gas plants are located or Cabo Negro on the other side of the strait. Both are connected by a 6-inch, 35-kilometer pipeline that was installed in 1983. In 1981, bids were solicited by ENAP and the National Energy Commision to use the large sources of natural gas for chemical plants. Two projects were chosen: an ammonia-urea project and a methanol project.

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[1] Physical scientist, Division of Foreign Data.

[2] Value and percentage of the 1983 gross domestic product were given as estimated figures in billions of 1977 Chilean pesos (Ch$) by the Central Bank.

The Mineral Industry of China

By E. Chin[1]

China's mineral industry continued to expand, and the output of the major mineral and metal commodities in 1983 equaled or exceeded the targets set for 1985. Development of mineral resources, especially coal and petroleum, is one of the key priorities of the country's current economic development plan.

State revenues in 1983 totaled $63.1 billion; domestic receipts, $61.2 billion; and foreign loans, $1.9 billion.[2] Taxes and receipts from state enterprises accounted for 64% and 20%, respectively, of total domestic receipts. Total expenditures were $65.3 billion. Expenditures for geological prospecting was $1.2 billion compared with $27.7 billion for capital construction and appropriations for key projects, $11.3 billion on health, education, and welfare, and $8.9 billion for national defense.

The value of China's trade grew by 6% from $40.8 billion in 1982 to $43.4 billion in 1983. Exports in 1983 were $22.1 billion compared with $21.3 billion for imports.[3] To encourage foreign trade, China had established special economic zones—Shantou, Shekou, Shenzhen, Xiamen, and Zhuhai. In addition, Hainan Dao and 14 coastal cities were opened for foreign investments—Beihai, Dalian, Fuzhou, Guangzhou, Lianyungang, Nantong, Ningbo, Qingdao, Qinhuangdao, Shanghai, Tianjin, Wenzhou, Yantai, and Zhanjiang. Government planners expected that rapid infusion of foreign technology in the coastal areas will in time be transferred to the interior of China, developing all of the country.

Between 1950 and 1983, China had invested about $450 billion in capital construction. About $180 billion was spent in developing heavy industry, compared with $45 billion for light industry. During 1953-78, priority was given to developing iron and steel and machine building capability. Presently, China's steel production capacity is 40 million tons per year. Since the 1960's, development of the energy sector was emphasized. China's oil wells have an aggregate output capacity of 110 million tons. In addition, more than 100 potential wells were going to be explored and evaluated during 1983-84. Downstream, there were 45 refineries in China with a total annual processing capacity of 100 million tons of crude oil. During the past 23 years, $25 billion was invested in coal mine development, culminating in an annual output capacity of about 715 million tons.

Investment in power generation totaled more than $35 billion between 1950 and 1983. There are 2,900 power stations, each with a capacity of more than 500 million kilowatts per hour. Eighty stations have a capacity of more than 250,000 kilowatts per hour.

Under the sixth 5-year plan (1981-85), 890 projects were designated for construction for China's modernization.[4] Seventy were to be key projects, accounting for 38.5% of the total state expenditure for the period. Twenty-one projects were for the energy sector. These were the Daqing and Shanghai petrochemical complexes; 8 for coal mine development, which included Gujiao, Datong, Huolinhe, Huaibei, Yanzhou, and Hainan; and 11 for hydro and thermal electric power generation including Gezhouba, Longyangxia, Baishan, Tianshengqiao, Douhe, Datong, Tongliao, Jinzhou, Hulan Ergi, and Taizhou.

Projects in the minerals sector included the Shanxi, Xianjiang, and Zhejiang fertilizer plants; Yunfu troilite mine; Baoshan iron and steel complex; Guizhou aluminum refinery; Yongping copper smelter; and the Huaihai, Jidong, and Ningguo cement plants.

In addition, there were nine projects for railway development and eight for port expansion or construction. Transport development is considered vital to China's industrial development. For instance, China is the world's largest producer of coal. However, coal production by region is uneven with about one-fifth of China's output from one Province, Shanxi. At present, 43% of all rail freight is coal. However, because of inadequate facilities, large quantities of coal are not being moved, and subsequently, user industries are not in full operation because of coal shortages. During the 1980's, four rail lines were to be double tracked, and six, electrified. Ten new railways were to be built, of which the Yanzhou-Shijiusuo and Beijing-Qinhuangdao Lines were considered the most important. Upon completion, the Yanzhou Line was designed to carry 18 million tons of coal per year to Shijiusuo Port, and the Beijing Line, 45 million tons of coal to Qinhuangdao Port. Construction of both ports were key projects. Shijiusuo will be China's first deepwater coal wharf. An 1,100-meter-long jetty, a berth for 100,000-ton ships, and a berth for 25,000-ton ships were under construction in 1983. Coal loading will be accomplished by conveyor belts. Shijiusuo Port is slated for multiple-use development, and there are construction plans for 27 berths for 10,000-ton vessels.

In 1983, China had 51,600 kilometers of rail track open to traffic, of which 2,500 kilometers was electrified. Passenger mileage during the year was 177.3 billion persons per kilometer, and freight mileage, 663.4 billion tons per kilometer.

The State Council passed a resolution in October to reinstate the National Committee on Mineral Reserves, which had been suspended in 1966. The committee will examine geological prospects for development, unify standards and formulate regulation for prospecting, and supervise prospecting operations. The committee is headed by the Minister of Geology and Mineral Resources and officials from other departments under the State Council.

The Government completed the reorganization and realignment of geological and minerals bureaus at the Provincial level, which included 34 subordinate units and 606 brigade-level units. Regional geological surveys were completed at the 1:200,000 scale for 95,000 square kilometers; 1:50,000 scale for 29,000 square kilometers; aerial prospecting for over 400,000 kilometers of survey lines; and gravity surveying for over 540,000 square kilometers.

The second-stage phase of the national survey for oil and gas was started, as well as intensified work in the study of coalfield geology. In the East China Sea, a trial oil and gas flow was obtained at Pinghu well. Commercial gas flow was obtained at the Chuan well in northwest Sichuan.

The 1983 targets for geologic prospecting of 23 minerals were met. There were 145 mineral deposits of industrial value discovered and verified during the year. Moreover, additional reserves were reported in 146 existing mines. Newly discovered reserves of coal in 36 deposits were estimated at 30 billion tons. Other finds included iron, manganese, copper, nickel, aluminum, zinc, tungsten, tin, gold, and silver.

China has established several geological remote sensing centers. Aerial remote sensing surveys were conducted in 11 areas covering 35,000 square kilometers. Landsat multispectral scanning data were used to verify and correct data in China's 1:1,000,000 geological map series. Construction of a Landsat ground receiving station was expected to begin in late 1984. Remote sensing techniques were used in 1983 for oil prospecting in the Qaidam Basin in conjunction with the U.S. Geological Survey and in the Ondos Basin by a Japanese oil company. Remote sensing has also provided data for exploration of coal and other mineral resources.

As part of an annual report, each of the Provinces, municipalities, and autonomous regions were asked to list five distinguishing achievements of the year. The following is a list of those achievements related to minerals:

1. Loading and discharging capacity of the salt wharf in Tianjin was increased from 1.41 to 4.61 million tons.
2. Construction of the Jingqin electrified double-tracked railway between Beijing and the port city of Qinhuangdao, with a total length of 281 kilometers, was completed.
3. In Anhui, the Fuyang-Huainan Railway was opened to traffic; the Panji and Juxianzhuang coal mines and a coalwashing plant began production; and construction started on the Xieqiao and Taoyuan coal mine and the Pingwei powerplant.
4. Energy savings by industry in Shandong was equivalent to 1.24 million tons of standard coal, exceeding its energy conservation plan by 24%.

5. Reserves of the Liaohe Oilfield in Liaoning was doubled, and production was increased 15%, making it the fourth largest oilfield in China.

6. In Nei Monggol, construction of the Huolinhe and Yiminhe surface coal mines was accelerated, and preliminary designs for the Zhungeer and Yuanbaoshan surface mines were completed.

7. Coal production in Shanxi, the largest coal producing Province in China, increased by 6.2% to 154 million tons.

8. In Qinghai, the Xining-Golmud section (834 kilometers) of the Qinghai-Xizang Railway was completed; pouring of the 600,000-cubic-meter concrete dam of the Longshanxia hydroelectric station was completed; and reconstruction of the poorest section of the Qingzang highway was completed.

9. Installation of the two largest ball mills in China was completed at the Yongping copper mine in Jiangxi, and individual trial runs were successful.

10. In Shanghai, installation of blast furnace No. 1 was completed at the Baoshan complex, and trial production was initiated.

11. For the first time since 1963, nickel production in Gansu broke through the 10,000-ton-per-year barrier at Jinchuan. Also, electrification of the 304-kilometer section between Baoji and Longxi of the Longhai Railway was completed.

12. Manufacture of a 520,000-ton urea synthesis tower was successfully completed in Nanjing, Jiangsu.

13. The Provincial department of geology and minerals in Hunan reported seven mineral deposits of commercial value for wolframite, lead and zinc, mercury, and gypsum. Also, 23 newly discovered mineralizations were identified—tin, kaolin, gold, scheelite, barite, dolomite, and the largest sepiolite deposit in China.

14. In Heilongjiang, Daqing achieved a stable output for the eighth consecutive year, producing 52 million tons of crude oil, accounting for one-half of China's total crude output in 1983.

15. Coal production in Henan, China's second largest coal producing Province, exceeded 60 million tons.

16. Construction of a flat-glass plant in Nanning, Guangxi, was completed and trial production begun. The plant has an annual production capacity of 1.2 million standard cases of glass.

17. In Yunnan, first-stage construction of the sodium triphosphate plant in Kunming was completed, and production trial runs were successful.

PRODUCTION

China produces a wide variety of mineral and metal commodities. It ranks among the world's top producing countries in output of antimony, barite, cement, fluorspar, iron and steel, magnesite, phosphate rock, salt, talc, tungsten, vanadium, and mineral fuels (oil and coal). In addition, it is a notable producer of diamond, gold, gypsum, ilmenite, manganese, and tin.

At the turn of the decade, there was a reordering of China's economic development plan, instituting a more realistic pace for modernization. A sixth 5-year plan (1981-85) was substituted for the ambitious 10-year plan (1981-90). Under the 5-year plan, development of China's heavy industry was balanced to support growth and development in light industry and agriculture. Output targets for the major commodities of the minerals sector in 1985 were as follows, in million metric tons unless otherwise specified:

Commodity	Quantity
Ammonia	15.80
Caustic soda	2.10
Cement	98.00
Coal:	
Coking	31.70
Dressed	51.00
Run-of-mine	700.00
Fertilizer materials:	
Chemical	13.40
Nitrogenous	10.55
Phosphatic	2.80
Gas, natural ---- billion cubic meters	10.00
Petroleum, crude	100.00
Phosphate rock	11.70
Pig iron	34.50
Pyrites	6.75
Steel, crude	39.00
Steel, rolled	29.30
Sulfuric acid	8.10

In 1983, output of each commodity met or exceeded the planned target for 1985.[5]

Table 1.—China: Estimated[1] production of mineral commodities[2]

(Metric tons unless otherwise specified)

Commodity[3]	1979	1980	1981	1982	1983^{p}
METALS					
Aluminum:					
Bauxite, gross weight[4]	1,500,000	^{r}1,700,000	^{r}1,800,000	1,950,000	1,950,000
Alumina, gross weight	750,000	750,000	750,000	775,000	825,000
Metal, refined, primary	360,000	360,000	360,000	380,000	400,000
Antimony, mine output, metal content	10,000	10,000	10,000	12,000	15,000
Bismuth, mine output, metal content	260	260	260	260	260
Cadmium metal, smelter	^{r}250	^{r}250	^{r}270	300	300
Copper:					
Mine output, metal content	200,000	200,000	200,000	275,000	350,000
Metal:					
Smelter, primary and secondary	200,000	200,000	200,000	275,000	350,000
Refined, primary and secondary	280,000	280,000	280,000	300,000	375,000
Gold, mine output, metal content troy ounces	200,000	225,000	1,700,000	1,900,000	2,000,000
Iron and steel:					
Iron ore, gross weight[5] thousand tons	75,000	75,000	75,000	75,000	75,000
Pig iron[6] do.	36,730	38,020	34,170	35,535	37,380
Ferroalloys do.	650	1,000	940	880	900
Steel, crude[6] do.	34,430	37,120	35,600	37,160	40,020
Steel, rolled do.	24,970	27,160	26,700	29,008	30,720
Lead:					
Mine output, metal content	155,000	^{r}160,000	^{r}160,000	160,000	170,000
Metal, refined, primary and secondary	170,000	^{r}175,000	^{r}175,000	175,000	185,000
Magnesium metal, primary	6,000	7,000	7,000	7,000	10,000
Manganese ore, gross weight thousand tons	1,500	1,600	1,600	1,600	1,600
Mercury, mine output, metal content 76-pound flasks	20,000	20,000	20,000	20,000	20,000
Molybdenum, mine output, metal content	2,000	2,000	2,000	2,000	2,000
Nickel:					
Mine	11,000	11,000	11,000	12,000	15,000
Smelter	^{r}11,000	^{r}11,000	^{r}11,000	12,000	15,000
Silver, mine output, metal content thousand troy ounces	2,000	^{r}2,000	^{r}2,100	2,300	2,500
Tin:					
Mine output, metal content	^{r}17,000	^{r}16,000	^{r}16,000	16,000	16,000
Metal, smelter	^{r}17,000	^{r}16,000	^{r}16,000	16,000	16,000
Tungsten, mine output, metal content	13,100	15,000	13,500	12,500	15,000
Zinc:					
Mine output, metal content	^{r}155,000	^{r}155,000	160,000	160,000	170,000
Refined, primary and secondary	160,000	160,000	^{r}165,000	165,000	175,000
NONMETALS					
Asbestos	140,000	131,700	106,000	110,000	160,000
Barite	500,000	680,000	775,000	900,000	1,000,000
Cement, hydraulic[6] thousand tons	73,900	79,860	84,000	94,072	108,250
Fluorspar	460,000	^{r}480,000	480,000	550,000	650,000
Graphite	182,000	160,000	184,000	185,000	185,000
Gypsum thousand tons	^{r}3,700	^{r}4,000	^{r}4,200	4,700	5,400
Kyanite	2,500	2,500	2,500	2,500	2,500
Lithium minerals, all types	^{r}14,000	^{r}14,000	^{r}14,000	14,000	15,000
Magnesite thousand tons	2,000	2,000	2,000	2,000	2,000
Nitrogen: N content of ammonia do.	8,821	9,990	^{r}12,193	12,711	15,000
Phosphate rock and apatite, P_2O_5 equivalent do.	^{r}1,874	^{r}2,360	^{r}2,530	2,580	2,750
Potash, marketable, K_2O equivalent do.	16	12	20	26	29
Pyrite, gross weight do.	3,700	3,800	^{r}3,800	3,800	3,800
Salt[6] do.	14,770	17,280	18,320	16,384	16,130
Sodium compounds: Sodium carbonate, natural and synthetic[6] do.	1,486	1,613	1,652	1,734	1,793
Sulfur:					
Native	200,000	200,000	200,000	200,000	200,000
Content of pyrite	^{r}1,700,000	1,700,000	^{r}1,700,000	1,700,000	1,700,000
Byproduct, all sources	400,000	400,000	400,000	400,000	400,000
Total	^{r}2,300,000	2,300,000	^{r}2,300,000	2,300,000	2,300,000
Talc and related materials	150,000	915,000	^{r}915,000	950,000	1,000,000
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Anthracite thousand tons	^{r}125,000	^{r}185,000	^{r}181,000	186,000	190,000
Bituminous and lignite do.	^{r}510,000	^{r}435,000	^{r}440,000	465,000	525,000
Total[6] do.	635,000	620,000	^{r}621,000	651,000	715,000
Coke, all types[6] do.	33,540	34,050	31,720	33,245	34,510
Gas, natural:					
Gross billion cubic feet	565	555	495	455	480
Marketed[6] do.	512	504	450	414	431

See footnotes at end of table.

Table 1.—China: Estimated[1] production of mineral commodities[2] —Continued

(Metric tons unless otherwise specified)

Commodity[3]	1979	1980	1981	1982	1983[p]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum:					
Crude (including crude from oil shale)[6] thousand 42-gallon barrels	775,000	773,435	738,906	744,994	774,311
Refinery products do.	470,000	470,000	450,000	475,000	500,000

[p] Preliminary. [r] Revised.

[1] Except data specifically footnoted as reported.

[2] Table includes data available through Aug. 10, 1984.

[3] In addition to the commodities listed for which quantitative estimates of output have been made, China is known or believed to have produced other commodities for which no estimates have been prepared.

[4] Includes diasporic bauxite for refractory applications.

[5] In terms of 50% Fe ore.

[6] Reported data.

TRADE

The total value of China's foreign trade was $43.4 billion in 1983, distributed by area as follows, in billion dollars: Asia, 23.6; Europe, 9.1; North America, 6.3; Latin America, 2.0; Africa, 1.2; and Oceania, 1.0. China's largest trading partners were as follows, in billion dollars: Japan, 10.0; Hong Kong, 7.5; the United States, 4.5; the Federal Republic of Germany, 2.1; Canada, 1.8; Jordan, 1.5; and the United Kingdom, 1.2.

The product mix of China's trade has been changing with a decrease in shipments of primary products as a result of the Government's emphasis to export value-added goods. However, lower prices for crude oil and coal in the world market somewhat moderated the change in the trade pattern. The configuration of China's trade in 1982-83 is given in table 2.

Table 2.—China: Foreign trade, by major category

(Million dollars)

Category	Exports		Imports	
	1982	1983	1982	1983
Primary products:				
Beverages and tobacco	95	105	129	46
Foodstuffs	2,979	3,019	4,218	3,059
Industrial materials	1,467	1,616	2,923	2,493
Mineral fuels	5,212	4,648	180	111
Other	113	201	.48	77
Total	9,866	9,589	7,498	5,786
Manufactured goods:				
Chemical products	859	920	2,748	3,123
Heavy industrial products	4,095	3,946	5,925	9,788
Light industrial products	7,102	7,685	2,755	2,608
Total	12,056	12,551	11,428	15,519

In 1983, China's exports of metals and minerals were classified as follows, in million dollars: crude fertilizers and crude minerals, 2,014; metalliferous ores and metal scrap, 175; coal, coke, and briquets, 335; petroleum and petroleum products, 4,311; natural gas, 1; miscellaneous chemicals, 117; manufactured fertilizers, 2; miscellaneous nonmetallic mineral manufactures, 282; iron and steel, 204; nonferrous metals, 145; and miscellaneous metal manufactures, 514. The major mineral and metal export commodities in 1983 were as follows:

Commodity	Quantity (metric tons)	Value (millions)
Aluminum products	10,552	$16
Antimony	12,216	23
Barite	792,285	32
Barium carbonate	30,146	6
Bauxite, refractory	57,001	4
Cement	380,193	17
Coal	6,860,000	304
Coke and semicoke	330,000	31
Coke, petroleum	133,281	10
Copper products	9,488	15
Fluorspar	523,029	41
Graphite electrodes	7,369	6
Iron and steel:		
Iron castings	31,840	7
Wire	90,984	37
Other products	534,031	132
Lithopone	29,347	11
Paraffin wax	111,427	50
Petroleum, crude	14,830,000	2,888
Petroleum products	4,910,000	1,314
Salt	960,000	20
Talc	534,378	30
Tin metal and alloys	3,643	38
Tungsten	65	1
Tungsten products	22	1
Zinc metal and alloys	2,051	1

China's major mineral imports in 1983 were as follows, in metric tons unless otherwise specified and million dollars:

Commodity	Quantity	Value
Aluminum metal and alloys	283,756	380
Caustic soda	247,021	76
Chromite	307,479	30
Coal	2,130,000	57
Copper metal and alloys	485,863	869
Diamond, industrial carats	358,123	7
Fertilizer materials:		
Ammonium sulfate	80,110	6
Urea	4,252,409	690
Other	3,662,791	696
Iron ore	3,924,101	116
Iron and steel:		
Wire	31,385	15
Other products	9,626,295	3,333
Soda ash	608,888	88
Sulfur	357,082	54
Zinc metal and alloys	22,870	177

Table 3.—China: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982^{p}	Destinations, 1982 United States	Destinations, 1982 Other (principal)
METALS				
Aluminum:				
Ore and concentrate	446,830	198,155	--	Japan 53,348; Italy 48,586; West Germany 44,469.
Oxides and hydroxides	30,406	115,081	94,796	Thailand 6,021; Hong Kong 3,500; Singapore 3,094.
Metal including alloys:				
Scrap	--	146	--	Hong Kong 144.
Unwrought	[2]26,885	48,836	--	Japan 30,789; Hong Kong 13,385.
Semimanufactures	884	4,972	--	Hong Kong 4,679.
Antimony:				
Ore and concentrate	3,438	1,386	--	Japan 698; West Germany 502.
Oxides	--	2,407	1,867	Japan 540.
Metal includng alloys, all forms	2,723	3,244	--	Japan 2,358; France 488.
Arsenic:				
Ore and concentrate	20	--		
Oxides and acids	74	2,155	1,280	Malaysia 570.
Beryllium: Oxides and hydroxides	1	50	39	Japan 11.
Cadmium: Metal including alloys, all forms	326	186	--	West Germany 166.
Chromium:				
Ore and concentrate	7,910	1,148	--	All to Japan.
Oxides and hydroxides	1,163	1,503	22	West Germany 591; France 454.
Metal including alloys, all forms	5	68	--	All to West Germany.
Cobalt:				
Oxides and hydroxides	44	36	--	Malaysia 20; Hong Kong 8.
Metal including alloys, all forms	--	6	--	All to France.
Columbium and tantalum: Ash and residue containing columbium and/or tantalum	478	--		
Copper:				
Sulfate	2,247	279	--	Japan 240; Hong Kong 39.
Metal including alloys:				
Scrap	4	241	--	Hong Kong 240.
Unwrought	[2]8,051	3,504	--	Japan 2,952; Hong Kong 552.
Semimanufactures	524	7,746	10	Hong Kong 7,260.
Germanium: Metal including alloys, all forms	3	1	--	All to Japan.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	1,029	273,966	--	West Germany 271,641.

See footnotes at end of table.

Table 3.—China: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982^{p}	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Iron ore and concentrate: Pyrite, roasted	10	--		
Metal:				
Scrap	146,113	98,317	--	Japan 50,478; Hong Kong 38,942.
Pig iron, cast iron, related materials	862,941	902,871	15,527	Japan 777,980; Singapore 49,685.
Ferroalloys:				
Ferromanganese	48,675	4,515	--	Japan 1,314; Hong Kong 1,313.
Ferromolybdenum	72	--		
Ferrosilicon	1,314	37,513	--	Japan 33,196.
Silicon metal	9,722	13,333	--	All to Japan.
Unspecified	86,697	34,031	4,766	Japan 27,594.
Steel, primary forms	136,381	172,087	6	Philippines 92,893; Singapore 30,120; Pakistan 26,345.
Semimanufactures[3]	128,204	782,481	2,234	Hong Kong 587,885; Singapore 36,141; Kuwait 32,575.
Lead:				
Ore and concentrate	--	54	--	All to United Kingdom.
Oxides	662	690	--	Japan 306; Pakistan 220; Thailand 50.
Metal including alloys:				
Scrap	--	50	--	All to Hong Kong.
Unwrought	2,512	2,124	50	Pakistan 807; Japan 500; Singapore 218.
Semimanufactures	668	127	--	Indonesia 114.
Lithium: Oxides and hydroxides	231	308	--	Netherlands 200; West Germany 51.
Magnesium: Metal including alloys, all forms	480	443	40	West Germany 275; Indonesia 45; Austria 44.
Manganese:				
Ore and concentrate	22,210	20,325	--	Japan 14,136; Thailand 2,932; West Germany 1,798.
Oxides	989	3,409	--	Hong Kong 1,629; France 680; Indonesia 398.
Metal including alloys, all forms	571	93	--	West Germany 52; Netherlands 41.
Mercury 76-pound flasks	10,063	8,578	87	Hong Kong 1,910; West Germany 1,770; Singapore 1,102.
Molybdenum:				
Ore and concentrate	369	([4])	--	All to Japan.
Oxides and hydroxides	100	6	--	Do.
Metal including alloys, all forms	69	16	--	Do.
Nickel:				
Oxides	--	19	--	All to Hong Kong.
Metal including alloys, all forms	8	3	--	Hong Kong 2.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$1,976	$3,170	$2,549	Japan $621.
Rare-earth metals	1,087	100	88	Japan 12.
Silver:				
Waste and sweepings[5] value, thousands	$148	$285	--	West Germany $249; Hong Kong $36.
Metal including alloys, unwrought and partly wrought do	$3,441	$1,158	--	France $771; Hong Kong $313.
Tin:				
Ore and concentrate	--	10	--	All to Hong Kong.
Metal including alloys:				
Scrap	6	434	428	Hong Kong 6.
Unwrought	5,462	4,263	2,631	Hong Kong 442; Japan 356; United Kingdom 204.
Semimanufactures	97	422	--	Hong Kong 416.
Titanium:				
Oxides	1,779	2,259	346	Hong Kong 562; Japan 489; France 344.
Metal including alloys, all forms	15	108	--	Belgium-Luxembourg 103.
Tungsten:				
Ore and concentrate	6,085	2,762	867	Hong Kong 650; West Germany 625.
Oxides and hydroxides	22	13	--	All to Belgium-Luxembourg.
Metal including alloys, all forms	246	169	136	Singapore 33.
Uranium and/or thorium:				
Ore and concentrate value, thousands	$58	$2,481	--	Japan $2,480.
Metal including alloys, all forms do	$115	$112	--	All to Indonesia.
Vanadium:				
Oxides and hydroxides	1,873	2,928	--	Belgium-Luxembourg 930; West Germany 858; Japan 786.
Ash and residue containing vanadium	4,944	NA		

See footnotes at end of table.

Table 3.—China: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982^{p}	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Oxides	1,339	4,734	1,144	West Germany 595; Japan 473; Singapore 465.
Metal including alloys:				
Unwrought	9,398	12,349	258	Japan 3,194; Hong Kong 2,750; Thailand 2,135.
Semimanufactures	57	412	30	Indonesia 290; Pakistan 50.
Other:				
Ores and concentrates	6,278	7,808	3,847	Yugoslavia 2,137; Thailand 615; Indonesia 507.
Oxides and hydroxides	8,365	9,520	2,122	Hong Kong 4,519; Singapore 807; Austria 669.
Ashes and residues	11,886	14,778	3,484	Hong Kong 6,962; West Germany 3,310.
Base metals including alloys, all forms:				
Quantity, reported	390	1,365	--	Japan 566; Hong Kong 362; United Kingdom 129.
Value only, reported thousands	$18,013	$4,892	$4,892	
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	521	1,787	--	Japan 1,039; Hong Kong 457.
Artificial:				
Corundum	7,119	10,174	97	Japan 6,212; Hong Kong 2,891; West Germany 591.
Silicon carbide	85	1,462	--	West Germany 898; Thailand 473.
Dust and powder of precious and semiprecious stones value, thousands	$6	$34	$23	United Kingdom $9.
Grinding and polishing wheels and stones	1,372	3,733	--	Hong Kong 1,291; Indonesia 1,229.
Asbestos, crude	3,642	5,065	--	Indonesia 1,925; Malaysia 1,332; Hong Kong 1,272.
Barite and witherite	797,722	833,159	708,208	West Germany 43,800; Japan 39,571; Netherlands 36,702.
Boron materials:				
Crude natural borates	--	323	1	Pakistan 288; Malaysia 30.
Oxides and acids	2,378	3,718	--	Japan 1,833; Hong Kong 412; Netherlands 400.
Cement	31,670	599,645	29	Hong Kong 599,426.
Chalk	41	4	--	Jordan 3.
Clays, crude	42,205	210,703	--	Japan 112,737; Hong Kong 72,826; Italy 9,686.
Cryolite and chiolite	760	267	250	Hong Kong 17.
Diamond:				
Gem, not set or strung value, thousands	$19,882	$7,799	--	Hong Kong $3,203; Belgium-Luxembourg $2,741; Japan $1,164.
Industrial do.	$983	$1,294	$127	Belgium-Luxembourg $1,145; Hong Kong $21.
Diatomite and other infusorial earth	20	32	--	Thailand 30.
Feldspar, fluorspar, related materials	362,060	423,245	77,638	Japan 274,398; West Germany 43,290; Hong Kong 14,440.
Fertilizer materials: Manufactured:				
Ammonia	NA	1,059	--	Hong Kong 977; Philippines 82.
Nitrogenous	109	1,465	--	Hong Kong 1,337.
Phosphatic	4,230	13,046	--	All to Japan.
Potassic	--	28	--	All to Malaysia.
Unspecified and mixed	753	1,366	1	Japan 1,309; Hong Kong 53.
Graphite, natural	43,598	48,334	8,594	Japan 28,998; United Kingdom 4,980; France 2,122.
Gypsum and plaster	785	4,336	--	Hong Kong 2,681; Indonesia 1,301.
Lime	293	36,985	--	Hong Kong 32,541; Singapore 4.419.
Magnesium compounds:				
Magnesite	110,853	304,916	15,651	Japan 158,789; West Germany 43,517; Netherlands 21,530.
Oxides and hydroxides	457	2,911	--	Japan 1,931; Hong Kong 980.
Other	93,897	--		
Mica:				
Crude including splittings and waste	9,783	11,801	3	United Kingdom 8,513; West Germany 2,011.
Worked including agglomerated splittings	82	65	--	Indonesia 32; Japan 30.
Nitrates, crude	--	29	--	All to Pakistan.
Phosphates, crude	--	30	--	All to Singapore.
Phosphorus, elemental	2,603	2,850	--	Japan 2,834.

See footnotes at end of table.

Table 3.—China: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982^{p}	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Pigments, mineral:				
Natural, crude	2,578	1,820	--	Japan 1,029; Hong Kong 431; Indonesia 340.
Iron oxides and hydroxides, processed	1,520	4,728	--	Egypt 1,774; Indonesia 1,023; Pakistan 900.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$10,893	$3,830	$173	Japan $2,526; Hong Kong $914.
Synthetic do	$28	$106	--	Italy $39; Hong Kong $30; Sweden $20.
Salt and brine	560,062	106,698	--	Hong Kong 71,317; Philippines 21,997; Malaysia 7,045.
Sodium compounds, n.e.s.:				
Carbonate, natural and manufactured	12,028	3,704	--	Hong Kong 2,805; Malaysia 230; Jordan 184.
Sulfate, natural and manufactured	241	61,490	--	Japan 33,528; Hong Kong 10,070; Singapore 8,116.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	58,991	69,568	14	Japan 63,805; Hong Kong 3,820.
Worked	6,812	20,855	--	Hong Kong 5,845; Singapore 5,646; Japan 5,206.
Dolomite, chiefly refractory-grade	--	100	--	All to Philippines.
Gravel and crushed rock	2,400	561,128	--	Hong Kong 558,660.
Limestone other than dimension	18	37,670	--	Hong Kong 37,620.
Quartz and quartzite	33,511	35,979	1	Japan 34,003; Hong Kong 1,525.
Sand other than metal-bearing	3,052	827,579	--	Hong Kong 827,476.
Sulfur:				
Elemental:				
Crude including native and byproduct	180	725	--	Hong Kong 540; Pakistan 185.
Colloidal, precipitated, sublimed	1,050	129	--	Singapore 100; Kuwait 26.
Sulfuric acid	9	3,439	--	All to Hong Kong.
Talc, steatite, soapstone, pyrophyllite	348,941	522,800	177	Japan 465,988; Indonesia 13,981; Hong Kong 12,128.
Vermiculite	115	--		
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	5,948	1,441	--	Malaysia 1,054; Singapore 287.
Carbon: Carbon black	5,459	5,610	--	Thailand 2,355; Hong Kong 906; Pakistan 482.
Coal:				
Anthracite and bituminous thousand tons	2,554	3,693	--	Japan 3,117; Hong Kong 427.
Briquets of anthracite and bituminous coal	4,000	--		
Lignite including briquets	800	1,108	--	All to Japan.
Coke and semicoke	19,618	44,793	--	Thailand 34,451; Indonesia 4,367; Hong Kong 3,500.
Petroleum:				
Crude thousand 42-gallon barrels	71,519	81,928	6,107	Japan 66,624; Philippines 4,816; Singapore 3,655.
Refinery products:				
Liquefied petroleum gas do	--	12	--	All to Hong Kong.
Gasoline do	14,303	20,180	10,529	Japan 8,460; Hong Kong 440; West Germany 344.
Mineral jelly and wax do	872	615	([6])	Singapore 148; Hong Kong 110; Pakistan 58.
Kerosine and jet fuel do	1,078	4,186	--	Hong Kong 2,027; Japan 1,932.
Distillate fuel oil do	3,748	10,290	--	Hong Kong 5,654; Singapore 1,943; Japan 1,634.
Lubricants do	168	479	14	Thailand 165; Hong Kong 131; Malaysia 71.
Nonlubricating oils do	5	--		
Residual fuel oil do	488	2,355	--	Hong Kong 1,177; Japan 1,147.
Bitumen and other residues do	19	80	--	Hong Kong 71.
Bituminous mixtures do	20	1	--	NA.
Petroleum coke do	891	761	--	Japan 760.

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^{p}Preliminary. NA Not available.

[1] Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by China, this table should not be taken as a complete presentation of this country's mineral exports. These data have been compiled from United Nations information and data published by the partner trade countries.

[2] Includes semimanufactures exported to Hong Kong.

[3] Excludes unreported quantities of wire exported to Malta and Yemen (Sanaa) valued at $24,000 and $70,000, respectively.

[4] Unreported quantity valued at $1,000.

[5] May include platinum-group metals.

[6] Less than 1/2 unit.

Table 4.—China: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982p	Sources, 1982	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	1	24	--	All from West Germany.
Aluminum:				
Oxides and hydroxides	10	31,100	--	Japan 31,071.
Metal including alloys:				
Scrap	--	63	--	All from Hong Kong.
Unwrought	26,808	17,583	--	France 8,793; Yugoslavia 4,996; Switzerland 1,550.
Semimanufactures	14,690	13,777	58	Japan 11,374; Hong Kong 1,025.
Chromium:				
Ore and concentrate	48,605	75,361	--	All from Philippines.
Oxides and hydroxides	86	346	309	Japan 32.
Cobalt: Oxides and hydroxides kilograms	50	20	--	All from Japan.
Copper:				
Ore and concentrate	30,995	54,597	--	All from Philippines.
Metal including alloys:				
Scrap	1,193	11,892	1	Japan 11,671.
Unwrought	35,138	35,708	16,069	Belgium-Luxembourg 13,624; Peru 5,006.
Semimanufactures	516	1,567	48	Hong Kong 756; Japan 400.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	NA	32,674	--	Philippines 25,364;[2] Hong Kong 7,307.
Iron and steel:				
Iron ore and concentrate thousand tons	1,831	NA		
Metal:				
Scrap	159	2,269	641	Hong Kong 1,520.
Pig iron, cast iron, related materials	75	326	(3)	Japan 172; Hong Kong 110.
Ferroalloys:				
Ferromanganese	100	--		
Unspecified	1,180	3	--	All from France.
Steel, primary forms	156,849	270,012	--	Japan 260,815; West Germany 8,262.
Semimanufactures thousand tons	120,976	3,172	(4)	Japan 2,584; West Germany 310; Belgium-Luxembourg 85.
Lead:				
Oxides	1,381	29	--	Mainly from Hong Kong.
Metal including alloys:				
Unwrought	27,539	120	8	United Kingdom 90; Hong Kong 20.
Semimanufactures	21	21	--	Japan 11; Hong Kong 10.
Lithium: Oxides and hydroxides	--	2	2	
Manganese: Oxides	285	288	--	Japan 275.
Molybdenum: Metal including alloys, all forms kilograms	50	12	--	All from Japan.
Nickel: Metal including alloys, all forms	[5]14	274	--	France 102; Hong Kong 90; United Kingdom 66.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$482	$30	--	Hong Kong $18; Japan $12.
Silver:				
Ore and concentrate[6] do	$3,453	NA		
Metal including alloys, unwrought and partly wrought do	$112	$842	$436	United Kingdom $175; Japan $128; Hong Kong $100.
Tin:				
Oxides	--	15	--	All from Japan.
Metal including alloys:				
Unwrought	12	45	--	Mainly from Hong Kong.
Semimanufactures	268	56	3	Hong Kong 47; Japan 6.
Titanium: Oxides	5,340	8,891	777	Japan 5,965; West Germany 1,501.
Tungsten: Metal including alloys, all forms	1	1	--	All from Japan.
Uranium and/or thorium: Ore and concentrate value, thousands	$89	NA		
Zinc:				
Oxides	--	13	--	Hong Kong 11.
Metal including alloys, all forms	12,896	27,215	2	Peru 10,747; Japan 7,609; West Germany 4,000.

See footnotes at end of table.

Table 4.—China: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982[P]	Sources, 1982	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	53	4	3	Japan 1.
Artificial: Corundum	176	21	--	Japan 11; Hong Kong 7.
Dust and powder of precious and semiprecious stones excluding diamond value, thousands	$42	$68	$67	Belgium-Luxembourg $1.
Grinding and polishing wheels and stones	[7]17	75	NA	Hong Kong 39; Japan 27.
Asbestos, crude	68	114	11	Japan 103.
Barite and witherite	--	1,138	--	All from United Kingdom.
Boron materials: Oxides and acids	2	10	10	
Cement	792	245,216	--	Japan 185,557; Hong Kong 58,209.
Clays, crude	596	3,640	232	Japan 1,725; Singapore 1,342.
Diamond:				
Gem, not set or strung value, thousands	$2,501	$2,848	$579	United Kingdom $1,127; Belgium-Luxembourg $986.
Industrial do	$6,762	$4,129	--	Belgium-Luxembourg $3,068; United Kingdom $948.
Diatomite and other infusorial earth	21	136	18	Singapore 105.
Fertilizer materials: Manufactured:				
Ammonia	1,130	5	--	West Germany 2; Hong Kong 2.
Nitrogenous thousand tons	1,588	1,343	329	Japan 470; Singapore 320; Netherlands 89.
Phosphatic	230,438	(8)		
Potassic	369,767	112,102	--	Singapore 78,292; France 22,810; West Germany 11,000.
Unspecified and mixed:				
Quantity, reported	546,555	702,734	458,332	Finland 66,939; Belgium-Luxembourg 51,711; Italy 49,826.
Value only, reported thousands	$8,330	--		
Graphite, natural	--	9	--	All from Japan.
Gypsum and plaster	33	87	47	Hong Kong 36.
Lime	--	319	--	All from Hong Kong.
Mica:				
Crude including splittings and waste	18	19	--	Mainly from Singapore.
Worked including agglomerated splittings	--	3	--	All from Hong Kong.
Phosphates, crude	259,661	119,545	--	Jordan 94,700; Egypt 24,845.
Pigments, mineral: Iron oxides and hydroxides, processed	1	112	12	Hong Kong 95.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$993	$5,278	$32	Hong Kong $3,943; Sri Lanka $636; West Germany $630.
Synthetic do	$28	$27	--	Hong Kong $15; Japan $12.
Salt and brine	220	503	--	Sri Lanka 250; Hong Kong 237.
Sodium compounds, n.e.s.:				
Carbonate, natural and manufactured	6,783	6,315	--	Yugoslavia 5,000; Hong Kong 1,315.
Sulfate, natural and manufactured	--	5	--	All from Hong Kong.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	36	25	--	Italy 17; Hong Kong 5.
Worked	37	394	(9)	Hong Kong 377.
Limestone other than dimension	--	143	--	All from Hong Kong.
Sand other than metal-bearing	148	88	--	Netherlands 42; Hong Kong 27; Japan 19.
Sulfur:				
Elemental, crude including native and byproduct	2,100	2,103	1	Japan 2,100.
Sulfuric acid	5,763	102,825	129	Japan 102,591.
Talc, steatite, soapstone, pyrophyllite	--	139	--	All from Hong Kong.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	14	--	Japan 10; Hong Kong 4.
Carbon: Carbon black	70	688	54	West Germany 374; Japan 222.
Coal:				
Anthracite and bituminous	113,678	59,833	59,514	Japan 301.
Lignite including briquets	--	62	--	All from Singapore.
Coke and semicoke	1	--		

See footnotes at end of table.

Table 4.—China: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum:				
Crude 42-gallon barrels	--	690,151	--	All from Kuwait.
Refinery products:				
Liquefied petroleum gas value, thousands	$7	$399	$6	Hong Kong $392.
Gasoline 42-gallon barrels	13,958	4,607	--	Belgium-Luxembourg 2,550; Hong Kong 2,000.
Mineral jelly and wax do	236	787	55	Hong Kong 575; Netherlands 87.
Kerosine and jet fuel do	11,965	25,148	--	Yugoslavia 14,678; Kuwait 7,912.
Distillate fuel oil do	1,783	41,007	--	Hong Kong 37,755; Yugoslavia 2,872.
Lubricants do	18,026	37,013	(10)	Hong Kong 16,875; Japan 12,788; West Germany 4,284.
Residual fuel oil do	NA	297,269	--	Hong Kong 296,936.
Bitumen and other residues do	6	--		
Bituminous mixtures do	145	454	--	United Kingdom 424.
Petroleum coke do	--	1,100	--	All from Japan.
Unspecified do	1,459	12,278	--	Japan 11,856.

[p] Preliminary. NA Not available.

[1] Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by China, this table should not be taken as a complete presentation of this country's mineral imports. These data have been compiled from United Nations information and data published by the partner trade countries.

[2] Contained in copper concentrate.

[3] Unreported quantity valued at $4,000.

[4] Less than 1/2 unit.

[5] Excludes unreported quantity valued at $49,000, of which $47,000 was from Japan.

[6] May include platinum-group metals.

[7] Excludes unreported quantity valued at $44,000, of which $27,000 was from Belgium-Luxembourg.

[8] Unreported quantity imported from the United States valued at $6,202,000.

[9] Unreported quantity valued at $15,000.

[10] Unreported quantity valued at $170,000.

COMMODITY REVIEW

METALS

Although China produces a wide variety of metals, the largest sector is iron and steel with an annual output capacity of 40 million tons. The nonferrous sector, as defined by Chinese classification, is inclusive of metals—aluminum, antimony, copper, lead, magnesium, mercury, nickel, tin, titanium, and zinc. The current level of production of nonferrous metals is about 1.2 million tons per year with the bulk of the output from aluminum, copper, lead, and zinc. The other metal categories include precious metals (gold, silver, and platinum-group metals) and rare metals (beryllium, columbium, molybdenum, tungsten, etc.).

Aluminum.—The alumina-aluminum complex at Guiyang, Guizhou, was commissioned in December 1981 with an annual metal output capacity of 40,000 tons. Second-stage expansion to double metal output was to be completed by 1983-84. Ingot output in 1983, however, was about 56,000 tons. Completion of the expansion at Guiyang and the construction of the Shanxi aluminum complex are included in China's key construction projects of the sixth 5-year plan (1981-85). Shanxi, known as the land of coal, has bauxite reserves of 210 million tons, about one-third of China's total reserves. The Shanxi aluminum facility will be equipped with Chinese-made equipment and was to be one of China's largest aluminum industrial centers encompassing mining, ingot production, and metal manufactures. Annual alumina capacity was to be 500,000 tons and for metal, 200,000 tons.

Copper.—The copper sulfide deposits in the mountains of northeastern Jiangxi constitute one-fifth of China's verified reserves of copper. This area is slated to become the nation's largest copper mining and smelting center with eventual output of copper at 200,000 tons per year. There will be five mines, and the best known, Dexing, has reserves of 8 million tons. Associated mineralization includes gold, silver, molybdenum, tungsten, lead, and zinc. Eighty percent of the ore is mined by the opencut method at Dexing. A production line to treat 5,000 tons of ore per day was installed in 1982, and a 15,000-ton-per-day line was in the planning stage. Construction of the Yongping Mine, south of Dexing, is one of China's key projects. Yongping was expected to start operation in 1984. Annual concentrate output from Yongping will be 86,000 tons (19,000 tons copper content). The flash smelter and acid-producing equipment were imported from Japan and Finland with assembly in 1983 done with Japanese aid. A power station and a 110,000-volt transmission line to the plant and mine has been installed. About one-half of the mine's railroad has been laid and an arched highway bridge was constructed to span the Xinjiang River south of the plant. Upon completion of all the projects, the center will produce 200,000 tons of copper per year.

A large copper deposit was discovered in Huili, Sichuan, with associated values of molybdenum, cobalt, gold, and silver. The deposit was described as large, concentrated, and amenable to open pit mining. In Anhui, a large high-grade copper deposit was discovered in Tongling on the Chang Jiang River. The deposit was described as extending 1,800 meters and containing gold, silver, and pyrites.

Gold and Silver.—Gold production in 1983 was 5.3% higher than in 1982. China has 20 major state-owned gold mines scattered throughout the country. The major producing Provinces are Shandong, Heilongjiang, and Henan. In Liaoning, there are 200 gold placer operations. A gold deposit was discovered in the eastern part of Yuheng Mountain in Fanshi, Shanxi, having a gold reserve of 10 tons. In Heilongjiang, Huma County, gold extraction has been intensified both by placer mining and by panning. A gold-mining dredge was being built for the Laogou Mine. At the Xinglonggou Mine, four dredges are in operation, yielding an annual output of about 150 kilograms of gold. Peak output for a dredge at the Hanjiayuanzi Mine was 500 kilograms in 1978. Additional dredges were to be put in operation at this site to increase production. Panning is controlled by the Huma County Gold Co., which designates sites opened to the public. Preparations were underway for mining a silver deposit in Zhaoyuan, Shandong. The silver reserves in this deposit were estimated to be 200 tons.

Iron and Steel.—China's reserves of iron ore, largely low grade and metallurgically complex, are estimated at 40 billion tons. For instance, the iron ore at the Bayan Obo Mine in Nei Monggol contains rare earths, columbium, sodium, potassium, fluorine, and phosphorus, making ore treatment difficult. Likewise, ore dressing is difficult for the titaniferous-magnetite deposit with associated vanadium at Panzhihua in Sichuan.

Iron reserves around Benxi, Liaoning, were estimated at 1.3 billion tons. Because the ore is high grade, mine output capacity was being expanded. Concommitantly, pig iron production was to be expanded from 3 to 3.75 million tons per year.

Combined production of steel at Anshan, Benxi, Dalian, Fushun, and Qiqihar in northeast China accounts for one-quarter of the total national output. The 6-million-ton-per-year Anshan complex, the largest of them, was being modified to reduce pollution and increase product line and quality.

First-stage construction of China's newest iron and steel complex at Baoshan was being accelerated to meet a completion target date of September 1985. A thermal powerplant with two 350,000-kilowatt-hour generating units and a 220,000-volt, high-tension power transmission line were placed in operation in 1983. Construction of the housing for a 5-million-ton ore sintering plant has been completed as well as the construction of a 1.6-kilometer freight dock, which will handle 20 million tons of cargo per year. Installation of other equipment included a 4,063-cubic-meter-inner-volume blast furnace and two 300-ton oxygen top-blown converters. Annual capacity at Baoshan after completion of the first-stage construction will include 3 million tons of pig iron, 3.12 million tons of steel ingot, 500,000 tons of seamless tubing, 2.4 million tons of billet, and 70,000 tons of chemicals.

Other Metals.—To meet raw material requirements for industrialization, China has intensified geological surveying, especially in the western part of the country. In Qinghai, a lead-zinc deposit was being developed at Xitieshan. A large nickel deposit with associated mineral values of copper, gold, silver, platinum, selenium, tellurium, and cobalt was reported in Karatunggu, and chromite was found in Junggar, Xinjiang. In Xizang, finds included gold, iron, lithium, chromite, and porphyry copper. The potential reserve of this porphyry copper deposit was estimated to rank second in China. In Guizhou, large finds of bauxite, antimony, and manganese were reported. This Province accounts for 80% of China's mercury reserves. In Hainan Dao, Guangdong, two cobalt occurrences were reported, one associated with copper and the other described as a primary deposit. Hainan Dao also has rich ilmenite deposits. There are two ore-dressing operations to separate the iron and titanium oxide for export. Although titanium minerals occur in 19 Provinces and regions, more than 90% of China's reserves are in Guangdong, Guangxi, Hebei, and Sichuan. In Nei Monggol, a lead-zinc mine with a daily production capacity of 500 tons was put in operation in Ongniud, and a 300-ton-per-day copper mine opened in Horqin Zouyi Zhong. In northeast Jiangxi, a lead-zinc deposit was being developed. Other deposits being developed include two lead-zinc mines and two tin mines in unspecified locations, a molybdenum mine in Shanxi, and a columbium-tantalum mine in Jiangxi.

NONMETALS

Cement.—Three cement plants are part of China's key construction projects—Jidong, Hebei; Huaihai, Jiangsu; and Ningguo, Anhui. Output of the Jidong plant was to relieve cement shortages in Beijing, Tianjin, and Hebei. Major equipment for the plant was imported from Japan. The 1.55-million-ton-per-year plant will be the largest cement producer in China.

Fertilizer Materials.—Three nitrogenous fertilizer plants, also key projects, were under construction in Shanxi, Zhejiang, and Xinjiang, with combined annual capacity of 900,000 tons of ammonia and 1.04 million tons of urea. Output of these plants was to meet the agricultural needs in Shanxi, Xinjiang, and the Chang Jiang River delta. The Zhenhai plant on the coast of Dong Hai in Zhejiang, the largest of the three, alone will produce a urea equivalent of 1.2 million tons of standard chemical fertilizer.

In Yunfu, Guangdong, construction of the world's largest troilite (hexagonal ferrous sulfide) mine was in progress. The troilite reserves at Yunfu, estimated at 200 million tons and concentrated in an area 4 kilometers long and 1 kilometer wide, were believed to be second only to those in Spain. Yunfu troilite averages 31.04% sulfur, with the richest concentration reaching 47%. The mine's iron reserves were estimated at 10 million tons with associated elements such as lead, zinc, and fluorine. Output of the mine will increase China's production of sulfuric acid by 2.4 million tons annually to better balance the country's production of nitrogenous, phosphatic, and potassic fertilizers. The mine is in partial production, and the ore is shipped by boat on the Xi Jiang River on which the mine is located. A railway will also be constructed to augment river transport.

There are 146 troilite deposit zones in Shanxi and various occurrences associated with the Province's five major coalfields. Potential reserves in Shanxi were estimated at 4 billion tons. To develop a mine in Shanxi would take 4 to 5 years and an investment of $25 per ton produced.

Construction of the 1.5-million-ton-per-year phosphate mine at Wangji, Hubei, was expected to be completed during the first half of 1985. Output from the mine will be used to produce nitrophosphate at a plant in Lucheng, Shanxi.

Central and Provincial authorities were drawing up plans to develop the phosphate resources in Wengan and Fuguan, Guizhou, which cover an area of 58 square kilometers. Initial plans call for a 4.5-million-ton-per-year mine to be later expanded to 7.5 million tons.

Other Nonmetals.—The Mangya asbestos mine in the Qaidam Basin in Qinghai began operation in October 1983 with an annual output capacity of 12,000 tons. Asbestos reserves at the mine were estimated at 30 million tons, one-third of China's known reserves. The high-grade fibers produced in Qinghai were to be sold in the domestic and foreign markets.

Two large bentonite occurrences were reported in Guangxi. A deposit covering 30 square kilometers was reportedly found in southern Guangxi with reserves of 100 million tons of bentonite. In western Guangxi, a bentonite deposit containing 43 million tons was discovered in Tiandong.

Gypsum reserves totaling 200 million tons were reported in uninhabited areas in Ngari and Nagqu, Xizang, covering an area of 500,000 square kilometers. Reserves of gypsum in Longyao, Hebei, were estimated at 400 million tons. The cement and building materials industry in Hebei use about 500,000 tons of gypsum per year.

The first meerschaum occurrence reported in China was a deposit found in Leping, Jiangxi, with reserves of 400,000 tons. The second find was reported in Liuyang, Hunan, with reserves of 1.5 million tons. Similar deposits were found in Liling and Xiangtan, not far from Liuyang:

A perlite deposit with reserves of 50 million tons was discovered in Xinyang, Henan. This occurrence accounts for over one-half of China's total perlite reserves. This deposit can be surface mined and contains zeolite and bentonite.

Two operations, with an output of 40 tons per year, mine jade in the Kunlun Mountains in Xinjiang. The jade varies in color from snow white, red, purple, to black-green. A chunk of jasper weighing 1.5 tons was found on the alluvial wasteland north of the Altun Mountains in Xinjiang. A 119.01-carat, light-yellow-colored diamond was found in Mengyin, Shandong. This is the third diamond of over 100 carats found in the Province. The diamond is an octahedron and hexoctahedron combination, 30.3 millimeters thick, 30.1 millimeters long, and 27.3 millimeters wide.

Quartzite resources in Yinan, Shandong, were estimated at more than 20 million tons, of which 6.5 million tons was exploitable. The quartzite grains have high silica content and low iron content. Mining could be done by the opencast method. The Government has approved the construction of a glass factory in the area. Along Guangdong's coastal area, there are 20 areas of quartz sand deposits scattered in Hainan, Zhanjiang, Taishan, Yanjiang, Zanxian, Xinhui, Zhuhai, Huilai, and Chaoyang. These coastal deposits have quartz sand particles that are of granular uniformity, contain little mud, and are of good quality for glassmaking. In addition, zircon and ilmenite can be recovered as byproducts.

A chemical industry based on salt production was being developed in the 200,000-square-kilometer Qaidam Basin in Qinghai. The area has 20 major salt lakes. Salt production at Caka Lake runs at 200,000 tons per year with a mining life estimated at 2,000 years. The largest salt lake in the basin is Qarhan, 5,000 square kilometers in area. Reserves at Qarhan are 100 times larger than at Caka but are mainly sylvite. The basin's mineralization includes mirabilite and borate in addition to sylvite and salt.

The 450,000-ton-per-year soda plant in Tianjin, which produces about one-quarter of China's output of soda ash, was being expanded to 600,000 tons. Completion was scheduled for 1986. Construction of a 600,000-ton-per-year soda plant in Lianyungang, Jiangsu, was to start in 1984 with completion scheduled in early 1988.

MINERAL FUELS

Coal.—China's verified coal reserves were estimated at 770 billion tons, sufficient for 400 years of mining at the present rate of production. During 1983, total coal production capacity was increased by 18.52 million tons. Part of the increase was from the opening of the 3-million-ton Panji Mine in Huainan, Hebei, and the 1.8-million-ton Dongpang Mine in Xingtai, Hebei. Construction of 26 new mines was started with an aggregate capacity of 23.94 million tons. Expansion of 14 existing mines was also initiated to add 8.49 million tons of annual capacity. New mine construction include two in Shanxi (each with 4 million tons annual capacity); one in Anhui (4 million tons); one in Shanxi (1.5 million tons); and one in Nei Monggol (1.2 million tons).

Eight of China's seventy key projects are for new mine construction or mine expansion, which would add about 50 million tons of new annual capacity. At the completion of the expansion of the Huolinhe Mine in Nei Monggol, the mine will produce 6 million tons per year of brown coal. This open pit mine has reserves of 12.9 billion tons in 24 seams, the thickest measuring 81 meters. Output at Huolinhe was expected to accelerate growth of industrial and agricultural output in Nei Monggol. When coal mine construction is completed in Huainan and Huaibei, Anhui, 40 million tons of annual capacity will be added. This would serve to improve the energy supply in east China where industries are densely located.

The priority for coal mine development by Province or region was Shanxi; followed by Shandong and Anhui; Nei Monggol, Henan, and the three northeastern Provinces (Heilongjiang, Jilin, and Liaoning); and lastly, Shaanxi and Guizhou. Shaanxi coal will be for power generation in Beijing, Tianjin, and Hubei, and for export. Production from Shandong and Anhui is for consumption in the coastal areas of Shandong, Shanghai, and Zhejiang, and for export. Production by the others will be for domestic consumption and for domestic sales to adjacent areas.

China's coal industry consists of 2,200 mines operated above the county level, employing 4,190,000 people. The Ministry of Coal Industry has jurisdiction over 580 of these mines, with a total combined capacity of 290 million tons per year. Mines operated by Provinces, prefectures, and counties number 1,634 with an aggregate capacity of over 180 million tons per year.

Production at Kailuan and Datong exceeds 20 million tons per year each. In addition, there are 10 coal mining centers that have production capacities exceeding 10 million tons per year each.

Raw coal production by state-owned mines in 1983, according to type, was as follows, in million tons: anthracite, 44.6; brown coal, 13.52; and bituminous coal, 330.8. About 73% of the bituminous output is classified as coking coal. National output of washed coal was 54.3 million tons, of which state-owned mines accounted for 87%.

Petroleum and Natural Gas.—Capital investment for onshore construction resulted in 1.38 million tons of added capacity for petroleum production and 6.73 million tons resulting from oilfield transformation and improvements. The planned annual growth rate for crude oil output for 1984-90 is 5% per year. China verified 570 million tons of new oil reserves in 1983. The largest discoveries were at Daqing in Heilongjiang and Renqiu in Hebei. New reserves were also found at Liaohe in Liaoning, Dagang in Hebei, Shengli in Shandong, and Zhongyuan in Henan. One of the top priorities for the Ministry of Petroleum Industry is geological exploration. Initial exploration will be concentrated in east China, then in the west. Exploration will be conducted in Anhui, Guangxi, and Guizhou, Jiangsu, Yunnan, and Zhejiang, where little or no oil has been found. Exploration for natural gas was to be in Sichuan, China's largest gas producer, and in Gansu, Jiangsu, Ningxia, and Shanxi, and for associated gas in oilfields in Heilongjiang and Henan.

Oil and natural gas were reported in 65 of the 90 exploratory wells sunk in the Tiandong Field, Guangxi. Preliminary estimates place the oil zone at 20 square kilometers. When developed, the Tiandong Field was expected to produce more than 100,000 tons of crude oil annually.

Thirteen exploratory and delineation wells were drilled in the Junggar Basin, Xinjiang in 1983. Four wells had indications of oil and gas and two had oil flows of commercial value. Previous drilling indicated 30 potential oil- and gas-bearing structures and an oilfield.

In an expansion program for the Zhongyuan Oilfield, 40 wells were drilled since 1975, resulting in several million tons of new oil reserves and about 10 billion cubic meters of natural gas. A new well on the edge of the oilfield, which covers 5,300 square kilometers, was producing a daily gas flow of close to 200,000 cubic meters in 1983.

A new oil zone at the Liaohe Field in Liaoning was placed in production in December. This zone produces annually 420,000 tons of oil and 100 million cubic meters of natural gas.

Offshore, geophysical exploration and exploratory drilling have been conducted in China's Continental Shelf in the Bohai Gulf, Beibu Gulf, the South China Sea, and the Zhu Jiang Estuary. Since August 1982, China National Offshore Oil Corp. has concluded 18 contracts with 27 oil companies from 9 countries for exploration-development tracts. In separate negotiations, contract areas were previously awarded to foreign oil companies in the Beibu Gulf, Bohai Gulf, and Yinggehai.

In the Zhu Jiang Estuary, an exploratory well of Esso Petroleum Co. had indications of oil. Further drilling will be conducted to delineate the oil-bearing structure.

Total Exploration Co. of France discovered 5 oil- and gas-bearing structures in the Beibu Gulf; 8 of the 14 exploratory wells sunk had oil and gas. Two wells produced a daily average each of 1,000 tons of oil. Preparations were being made for trial production beginning in the spring of 1985.

The test well of Atlantic Richfield Co. (ARCO) in the South China Sea had a gas flow equivalent to 1.2 million cubic meters per day. ARCO estimates the gas reserves in the structure at 80 billion cubic meters, equivalent to 80 million tons of oil. Delineation drilling was to begin to determine the actual reserves. If feasible, the natural gas would be used as raw material at a chemical fertilizer plant to be built on Hainan Dao. In October, ARCO's drill ship, *Glomar Java Sea*, was sunk during a severe tropical storm.

In addition to Total, Esso, and ARCO, other companies conducting exploration in Nan Hai include Pennzoil Far East Co., Sun Orient Exploration Co., Idemitsu Oil Development Co. Ltd., Occidental Eastern Inc., and BP Development Ltd.

In the Bohai Gulf, Japan National Oil Co. has delineated six oil- and gas-bearing structures. Ten of the sixteen wells had oil and gas flows; two producing a daily average of more than 1,000 tons of oil each. Plans for developing this zone were expected to be finalized in early 1985.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Chinese yuan (Y) to U.S. dollars at the rate of Y1.98=US$1.00.

[3] Economic Information and Agency (Hong Kong). China's Customs Statistics. No. 2, June 1984, 111 pp.

[4] China Reconstructs (Beijing). Key Projects Under Construction. V. 33, No. 4, Apr. 1984, pp. 15-18.

[5] State Statistical Bureau (Beijing). Communique on Fulfillment of China's 1983 National Economic Plan. Apr. 1984, 11 pp.

The Mineral Industry of Colombia

By H. Robert Ensminger[1]

New mining activities contributed to a resurgence in the mining sector. One such enterprise was the Cerro Matoso nickel mining project, which was put on-stream in late 1982. Coal mining achieved significant growth in 1983, as did coal exports. Iron ore production registered positive growth, but precious metals, Colombia's second most important mining activity, took a negative turn, owing to lower international prices.

The La Guajira Peninsula, one of Colombia's less developed regions, was poised to emerge as the nation's major coal producer when full production begins in early 1985. The project at El Cerrejón, which began coal production in 1983, is considered to be the largest strip mining operation in the world.

Studies were begun on several bauxite, copper, and gold projects.

Colombia's economic picture was mixed. The gross national product grew only 1.1% in real terms, one of the lowest figures in decades; however, inflation was reduced to 16.6%, down from 24% in 1982.

In 1983, the Colombian Government began implementing a $20 billion,[2] 4-year National Development Plan emphasizing construction, energy, mining, health care, and agribusiness development.

Owing to the leading role of petroleum and natural gas, Colombia's most important mineral resource activities, mining as a whole performed well. Petroleum production reached 150,000 barrels per day by midyear and near 165,000 barrels per day by yearend. The most important petroleum find was in the eastern Llanos region, which increased Colombia's oil reserves by about 10%. Colombia expected to reach oil self-sufficiency by 1985.

PRODUCTION

According to Empresa Colombiana de Petróleos (ECOPETROL), crude oil production was about 55.5 million barrels, an increase of 8% over that of 1982. Natural gas production was 185.3 billion cubic feet, which represented a 3% increase over the 1982 figure. Coal production for 1983 was slightly below the level for 1982. Production of coal was expected to increase markedly in 1985 when the El Cerrejón Norte project gets underway.

Iron ore production in 1983 showed a 11% increase over that of 1982. Precious metals production, Colombia's second most important mining activity, took a negative turn owing to lower international prices. Gold decreased 11% and platinum decreased 17%, although silver increased slightly. In the precious stone category, emerald production dipped 27%. Nickel production was up dramatically as the Cerro Matoso Mine was operating much nearer full capacity than in 1982. Cement production showed a slight increase over that of 1982.

Colombian steel production was up approximately 5% over that of 1982, while pig iron production rose about 10% for the same period.

Table 1.—Colombia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
METALS					
Chromite, gross weight	(2)	--	--	--	--
Copper, mine output, metal content	84	111	113	113	113
Gold troy ounces	269,369	510,439	529,214	481,846	[3]428,779
Iron and steel:					
Iron ore and concentrate thousand tons	397	506	419	405	450
Pig iron do.	241	279	233	246	[3]270
Ferroalloys: Ferrosilicon[e]	1,200	1,200	1,200	1,200	1,200
Steel, crude thousand tons	362	405	395	445	[3]467
Semimanufactures, hot-rolled do.	307	320	340	[e]340	340
Lead:					
Mine output, metal content	226	187	154	391	390
Refined (secondary)	2,500	3,000	3,000	[e]3,000	3,000
Manganese ore, gross weight	21,453	21,400	20,300	[e]20,000	20,000
Nickel	NA	NA	NA	1,000	[3]13,600
Platinum-group metals troy ounces	12,933	14,345	14,804	[e]20,000	16,600
Silver do.	99,331	151,542	142,740	125,848	126,000
Zinc, mine output, metal content	--	--	[4]152	[e]150	150
NONMETALS					
Asbestos	NA	NA	1,000	[e]1,000	1,000
Barite	3,500	3,200	3,380	3,400	3,400
Cement, hydraulic thousand tons	4,257	4,351	4,459	[e]5,031	5,215
Clays:					
Bentonite	(2)	--	--	--	--
Kaolin	819,150	786,384	810,000	810,000	810,000
Diatomite	[e]630	630	630	[e]630	630
Feldspar	29,200	27,150	27,500	27,500	27,500
Gypsum thousand tons	257	262	298	300	[3]300
Lime, hydrated and quicklime[e] do.	1,300	1,300	1,300	1,300	1,300
Magnesite	1,582	[e]1,600	1,600	[e]1,600	1,600
Nitrogen: N content of ammonia	66,000	70,000	91,500	97,800	[3]102,000
Phosphate rock	6,776	6,370	[4]6,705	[e]6,700	18,000
Precious and semiprecious stones: Emerald[4] carats	1,228,488	275,111	299,006	300,000	219,000
Salt:					
Rock thousand tons	383	347	316	301	300
Other do.	369	491	399	202	400
Total do.	752	838	715	503	700
Sodium compounds: Sodium carbonate	133,217	124,629	125,000	[e]125,000	118,000
Stone and sand:					
Calcite	8,500	8,620	8,740	8,700	8,700
Dolomite thousand tons	29	14	15	15	15
Limestone do.	9,700	9,760	10,053	10,000	10,000
Marble	16,891	17,000	16,660	17,000	17,000
Sand excluding metal-bearing	480,000	492,000	502,300	500,000	500,000
Sulfur:					
Native (from ore)	16,050	25,647	26,300	[e]26,000	26,000
Byproduct, from petroleum	2,262	1,959	2,200	[e]3,000	3,000
Total	18,312	27,606	28,500	[e]29,000	29,000
Talc, soapstone, pyrophyllite	6,085	5,900	6,050	6,000	6,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, all grades thousand tons	4,885	4,947	5,030	6,500	5,800
Coke, all types do.	507	500	500	[e]550	550
Gas, natural:					
Gross million cubic feet	150,695	160,666	174,800	179,930	[3]185,300
Marketed do.	108,181	118,534	120,000	[e]130,000	130,000
Natural gas liquids:					
Propane thousand 42-gallon barrels	2,491	2,712	2,800	[e]2,800	2,800
Butane do.	552	577	600	[e]600	600
Natural gasoline do.	816	790	800	[e]800	800
Total do.	3,859	4,079	4,200	[e]4,200	4,200
Petroleum:					
Crude do.	45,298	45,944	48,939	51,100	[3]55,480
Refinery products:					
Gasoline:					
Aviation do.	443	428	370	446	450
Motor do.	18,042	20,400	23,500	22,827	20,640
Jet fuel do.	3,517	3,521	3,500	4,385	4,360
Kerosine do.	3,209	2,730	3,000	2,446	2,240

See footnotes at end of table.

Table 1.—Colombia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982^{p}	1983^{e}
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum —Continued					
Refinery products —Continued					
Distillate fuel oil thousand 42-gallon barrels	7,768	8,584	9,500	9,857	10,030
Residual fuel oil do	15,254	17,023	15,400	18,295	19,320
Lubricants do	511	403	550	550	550
Other:					
Liquefied petroleum gas do	1,729	1,975	2,050	2,172	2,520
Asphalt and bitumen do	706	942	1,130	1,236	1,200
Refinery fuel and losses and unspecified products do	8,067	7,239	7,000	5,045	4,920
Total do	59,246	63,245	66,000	67,259	66,230

^{e}Estimated. ^{p}Preliminary. NA Not available.

[1] Table includes data available through Aug. 2, 1984.

[2] Revised to zero.

[3] Reported figure.

[4] Data represent total registered Colombian exports.

TRADE

In 1983, a noteworthy increase took place in bituminous coal exports, which rose to 500,000 tons, an increase of approximately 130% over that of 1982. Exports were expected to rise to about 900,000 tons in 1984. Carbones de Colombia S.A. (CARBOCOL), the state-owned coal mining company, stated that coal shipments could rise to 30 million tons per year by the end of the decade.

In 1983, Israel signed an agreement with CARBOCOL to receive 300,000 to 500,000 tons of coal per year from El Cerrejón Norte beginning in 1986. CARBOCOL shipped 125,000 tons of coal from El Cerrejón Central to a Puerto Rican cement company during 1983.

The value of fuel oil and petrochemicals exports increased from $284 million in 1982 to about $400 million in 1983. The increased value of exports of fuel oil and petrochemicals helped offset the drop in value of coffee exports and other miscellaneous exports.

Delegates from Latin America attended the International Seminar on Energy Planning in Cartagena. The Colombian Ministry of Mines and Energy's proposal for the creation of a coal producers association to control prices and regulate the market was well received.

Colombia planned, beginning in 1984, to export 130 million tons of coal over a 7-year period.

Table 2.—Colombia: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, unwrought	NA	57	--	Ecuador 47; Peru 6.
Copper:				
Ore and concentrate	3,317	857	--	All to Japan.
Metal including alloys, all forms	12	20	1	Venezuela 12; Ecuador 6.
Iron and steel: Metal:				
Pig iron, cast iron, related materials	NA	1,303	206	Netherlands 1,097.
Semimanufactures:				
Bars, rods, angles, shapes, sections	341	43	--	All to Venezuela.
Universals, plates, sheets	8	26	--	Mainly to Ecuador.
Hoop and strip	NA	20	--	All to Ecuador.
Wire	53	8	--	Mainly to Venezuela.
Tubes, pipes, fittings	512	233	58	Ecuador 103; Panama 30; Suriname 24.
Castings and forgings, rough	314	172	--	Peru 110; Venezuela 61.
Lead:				
Ore and concentrate	92	331	331	
Metal including alloys, all forms	12	15	--	All to Venezuela.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$546	$185	--	All to Panama.
Zinc: Oxides	110	190	--	All to Ecuador.
NONMETALS				
Cement	698,538	671,556	669	Trinidad and Tobago 326,409; Venezuela 187,298.
Chalk	2,417	4,268	--	Venezuela 2,360; Dominican Republic 1,220.
Clays, crude	1,392	1,511	--	Ecuador 330; Venezuela 60.
Fertilizer materials: Manufactured, ammonia	18,632	25,064	--	Denmark 11,135; Netherlands 5,979; France 3,999.
Gypsum and plaster	660	463	--	Venezuela 360; Ecuador 100.
Phosphates, crude	300	1,100	--	All to Venezuela.
Salt and brine	5,250	7,500	--	Do.
Sodium compounds, n.e.s.: Carbonate, manufactured	NA	1,360	--	Argentina 1,310; Ecuador 50.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	50	60	--	All to Peru.
Worked	87	110	--	All to Venezuela.
Gravel and crushed rock	111	132	--	Trinidad and Tobago 108.
Sand other than metal-bearing	26	27	--	Panama 14.
Sulfur: Elemental, crude including native and byproduct	1,704	5,858	--	Ecuador 2,826; Trinidad and Tobago 2,012.
Talc, steatite, soapstone, pyrophyllite	90	61	--	Venezuela 50; Panama 10.
Other: Crude	1,140	390	--	Ecuador 330; Venezuela 60.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	3,931	3,309	--	Ecuador 2,903; Costa Rica 221.
Coal: All grades including briquets value, thousands	$9,454	$13,973	NA	NA.
Coke and semicoke	33,704	24,005	--	Venezuela 21,044; Ecuador 1,840.
Petroleum refinery products:				
Mineral jelly and wax thousand 42-gallon barrels	33	25	16	Netherlands Antilles 5; Netherlands 2.
Residual fuel oil do	1,053	11,481	2,104	Italy 6,852; Netherlands 1,736.

NA Not available.

[1] Table prepared by John G. Panulas.

Table 3.—Colombia: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	5,922	3,033	2,596	West Germany 230; United Kingdom 135.
Metal including alloys:				
Unwrought	15,734	14,265	272	Venezuela 8,211; Canada 3,013; Yugoslavia 1,698.
Semimanufactures	--	6,620	776	Venezuela 2,049; France 1,389.
Chromium: Oxides and hydroxides	97	90	66	West Germany 18; Spain 6.
Cobalt: Oxides and hydroxides	6	10	3	United Kingdom 5; West Germany 1.
Copper: Metal including alloys:				
Unwrought	2,316	888	22	Chile 300; Belgium-Luxembourg 299; Mexico 146.
Semimanufactures	10,458	12,862	576	Chile 6,910; Peru 2,402; Mexico 1,014.
Iron and steel:				
Iron ore and concentrate	1,602	282	--	All from Venezuela.
Metal:				
Scrap	29,968	26,982	11,586	Netherlands Antilles 11,884; Ecuador 1,857.
Pig iron, cast iron, related materials	7,046	6,580	686	Brazil 3,436; Mexico 1,672.
Ferroalloys	5,424	6,090	432	Brazil 3,333; Mexico 1,672.
Steel, primary forms	57,433	50,716	774	Spain 16,438; Japan 9,745; West Germany 7,822.
Semimanufactures:				
Bars, rods, angles, shapes, sections	61,803	72,502	3,188	Brazil 22,763; Venezuela 12,511; United Kingdom 9,088.
Universals, plates, sheets	270,678	304,807	2,697	Japan 164,204; Venezuela 26,517; West Germany 24,306.
Hoop and strip	4,179	5,568	553	Japan 2,138; United Kingdom 1,930.
Rails and accessories	1,434	1,993	1,035	Belgium-Luxembourg 598; United Kingdom 197.
Wire	7,091	7,875	323	Brazil 3,502; Venezuela 2,086.
Tubes, pipes, fittings	94,702	131,463	14,288	Japan 78,419; Argentina 13,611.
Castings and forgings, rough	1,798	902	397	Spain 328; Belgium-Luxembourg 86.
Lead:				
Oxides	796	934	--	Peru 618; Mexico 316.
Metal including alloys:				
Unwrought	290	1,504	10	Peru 925; Mexico 442; Denmark 127.
Semimanufactures	600	401	10	Peru 357; Costa Rica 14.
Magnesium: Metal including alloys, unwrought	81	27	27	
Manganese:				
Ore and concentrate	3,993	4,284	1,490	Mexico 2,794.
Oxides	1,126	1,536	102	Brazil 1,015; Belgium-Luxembourg 251; United Kingdom 118.
Nickel: Metal including alloys:				
Unwrought	245	121	108	Canada 7; Austria 3.
Semimanufactures	146	133	80	Canada 30; France 15.
Platinum-group metals: Metal including alloys, unwrought and partly wrought value, thousands	$13	$20	$17	West Germany $1.
Silver: Metal including alloys, unwrought and partly wrought do	$143	$71	$14	Spain $27; West Germany $17.
Tin: Metal including alloys, all forms	383	390	--	Bolivia 383; Bahamas 5.
Titanium: Oxides	410	526	234	West Germany 157; United Kingdom 71.
Zinc:				
Oxides	458	304	12	Peru 134; Venezuela 110.
Metal including alloys, unwrought	13,654	15,180	2	Peru 12,433; Canada 1,612.
Other:				
Ores and concentrates	200	777	1	Netherlands 344; United Kingdom 235.
Base metals including alloys, all forms	43	81	35	Bolivia 35; Peru 6.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	60	57	14	Italy 27; Peru 11.
Asbestos, crude	21,492	25,945	2,209	Canada 20,433; Republic of South Africa 2,682.
Barite and witherite	6,164	6,497	6,210	Venezuela 27.
Boron materials:				
Crude natural borates	461	853	2	Peru 850.
Oxides and acids	1,448	351	125	Peru 165; West Germany 46.
Clays, crude	12,371	14,522	13,833	Peru 499; Spain 57.
Feldspar, fluorspar, related materials	43	390	375	West Germany 15.

See footnotes at end of table.

Table 3.—Colombia: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials: Manufactured:				
Ammonia	14,655	19,522	1	Venezuela 19,495.
Nitrogenous	160,181	197,780	51,953	Venezuela 109,503; U.S.S.R. 15,555; Netherlands 11,008.
Phosphatic	21,939	16,571	16,271	Belgium-Luxembourg 300.
Potassic	97,176	161,814	72,492	Spain 39,285; East Germany 34,503; West Germany 10,126.
Unspecified and mixed	46,826	139,133	129,160	Romania 9,590.
Gypsum and plaster	66,830	63,860	55	Jamaica 36,589; Dominican Republic 22,277.
Magnesite	492	135	30	West Germany 59; France 31.
Nitrates, crude	81	475	--	Chile 455; West Germany 20.
Phosphates, crude	37,849	67,285	67,285	
Pigments, mineral: Iron oxides and hydroxides, processed	1,059	1,539	138	West Germany 1,253.
Precious and semiprecious stones other than diamond value, thousands	$13	$15	$8	Brazil $7.
Salt and brine	87	4,477	3,296	Ecuador 1,154; West Germany 27.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	37	4,015	4,012	West Germany 3.
Sulfate, manufactured	114,169	11,894	1,001	Mexico 10,771; West Germany 111.
Stone, sand and gravel:				
Dolomite, chiefly refractory-grade	4,222	3,454	1,913	Belgium-Luxembourg 1,301.
Gravel and crushed rock	16,345	1,396	4	Venezuela 1,242; Italy 86.
Sand other than metal-bearing	77	250	186	Mexico 48; Sweden 15.
Sulfur:				
Elemental: Crude including native and byproduct	21,907	31,783	31,782	NA.
Sulfuric acid	56	56	6	West Germany 22; Italy 16.
Talc, steatite, soapstone, pyrophyllite	2,128	2,733	1,676	Italy 983; Brazil 30.
Other: Crude	35,258	6,909	2,450	Guadeloupe 2,940; Mexico 998; United Kingdom 360.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	117	169	42	Venezuela 126.
Carbon: Carbon black	888	1,148	807	West Germany 308.
Coal: Lignite including briquets	90	20	--	All from Brazil.
Gas, natural thousand cubic feet	455	1,005	53	France 952.
Petroleum:				
Crude thousand 42-gallon barrels	10,783	5,993	644	Venezuela 5,194.
Refinery products:				
Gasoline do	5,968	6,132	169	Netherlands Antilles 3,212; Peru 2,040.
Mineral jelly and wax do	38	24	13	Spain 4; West Germany 2.
Kerosine and jet fuel do	398	333	333	
Distillate fuel oil do	4,048	4,314	112	Panama 2,720; Venezuela 1,482.
Lubricants do	226	263	103	Netherlands Antilles 85; Venezuela 75.
Nonlubricating oils do	17	7	7	

NA Not available.

[1] Table prepared by John G. Panulas.

COMMODITY REVIEW

METALS

Iron and Steel.—Colombia produced 467,000 tons of steel and 270,000 tons of pig iron in 1983. These were substantial increases over those of 1982. There were 340,000 tons of hot-rolled steel products produced. Colombia had seven electric arc steel furnaces operating; one in Boyaca, two in Cali, two in Bogota, and two in Medellín.

The Government of Colombia assisted the country's major steelmaker, Acerías Paz del Río S.A. (APR), in a liquidity crisis, following losses of $16.4 million in 1982, and a stock of 7,000 tons of unsold steel. Steel production by Colombia's largest steel mill, owned by APR, increased by 29.7% over 1982 levels.

Nickel.—The Cerro Matoso Mine produced 13,600 tons of nickel compared with a production of 1,000 tons in 1982, the startup year. Billiton Metals and Ores International Ltd. announced that the Cerro Matoso operation would reach full capacity of 22,500 tons per year some time in 1984 and by yearend will have produced approximately 18,000 tons of nickel. The smelter at the Cerro Matoso Mine was shut down for repairs in December 1983, with the work expected to last through January 1984. Billiton Metals was planning to install a granulating operation by the middle of

1984, enabling the company to produce a variety of sizes of ferronickel "shot" for the world market.

Precious Metals.—About 430,000 troy ounces of gold was produced in 1983; of this total, 40,200 ounces was produced by the Segovia Mine near Segovia in the Department of Antioquía. This mine also produced approximately 95,000 ounces of silver, which comprised nearly 75% of the total production. Several gold veins were discovered near Peid Rancha in the Department of Narino. The veins were reported to contain 9 grams of gold per ton, 59 grams of silver per ton, and 3.6% zinc.

The U.S. State Department's Trade and Development Program announced it hopes to involve several U.S. governmental agencies and one U.S. university in locating riverbed placer deposits of platinum and their source in Colombia.

NONMETALS

Cement.—Cement production for 1983 was estimated at approximately 5.2 million tons, which was slightly more than that of 1982.

Emeralds.—In 1983, Empresa Colombiana de Minas (ECOMINAS) and the United Nations began a 30-month, $2.5 million program to explore for emeralds and study more efficient mining techniques. In the first 9 months of the program, potential exploration sites were targeted. Exploration was to be conducted over a 15-month period scheduled to end in December 1984. The final phase, a study on development methods and mine design, was to be completed in mid-1985. The program was also to set up a model for exploration and development of additional reserves at Muzo, Coscuez, Peeas Blancas, and other established mines.

Phosphate Rock.—The feasibility study begun for ECOMINAS in 1982 by a consortium that consisted of Hansa Luftbild (Federal Republic of Germany), International Fertilizer Development Center of Alabama (United States), Colorado School of Mines Research Institute (United States), Singmaster and Breyer Inc. of New York (United States), and Instituto Nacional de Investigaciónes Geologico-Mineras was completed in 1983. The study recommended a project that would produce 50,000 tons per year during its first stage, and 100,000 tons per year during the second stage. The overall cost was projected to be $255 million at 1981 prices.

MINERAL FUELS

Coal.—Colombia's coal reserves were estimated at approximately 16.5 billion tons in 1983. This constitutes nearly 38% of Latin America's total coal reserves. Of this total El Cerrejón Norte's proven reserves constitute 3.0 billion tons, while the central region contains approximately 550 million tons. At the present time, Colombia has about 700 mines; 92% of which produce less than 12,000 tons of coal per year.

CARBOCOL and International Colombia Resources Corp., a subsidiary of the Exxon Corp. of the United States, who jointly own the El Cerrejón Norte operation, signed a contract in 1981 with Morrison-Knudsen Co. Inc., a U.S. company, to build a seaport in Bahía de Portet for shipping the coal. The port, which was to be completed in 1986, was to be on the Guajira Peninsula, approximately 150 kilometers from the mine. The port, to be Colombia's largest, was designed to ship 15 million tons of coal per year, and to have a storage capacity of 1.7 million tons.

Hydroelectric.—The Salvajima 270-megawatt multipurpose project, which was to benefit Colombia's southwestern Cauca Valley, was to be completed by late 1984. It was to have the dual capacity of providing hydroelectric power and flood control. Observers consider it to be the most carefully researched infrastructure project currently under construction in Colombia.

Petroleum and Natural Gas.—The number of oil exploration wells dropped from 73 in 1982 to 45 in 1983, while investment declined from $193 million to $120 million. ECOPETROL waged a campaign to maintain exploration-development momentum by concluding 20 association contracts with foreign firms by yearend.

Six petroleum basins continued to be exploited in various parts of Colombia. The preponderance of the country's crude oil has been produced from the Middle Magdalena Basin. The newest petroleum development "hot spot" was northeast Colombia's Eastern Plains, also called the Llanos Basin, where production more than tripled from June 1982 to June 1983.

Construction of two 18-inch fuel oil pipelines was begun for ECOPETROL in 1983. Four smaller diameter pipeline proposals were put up for bids during the year.

At yearend, proved reserves for petroleum were 560 million barrels with reserves of 4.3 trillion cubic feet of natural gas.

Petrochemical production for the year was 215,000 tons, which approximated the level for 1982.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Colombian pesos (Col$) to U.S. dollars at the average exchange rate of Col$78.90 = US$1.00.

The Mineral Industry of Cyprus

By Thomas O. Glover[1]

The Republic of Cyprus has been geopolitically divided for a decade. The northern one-third of the island was controlled by the Turkish Cypriots, who proclaimed their area to be the "Turkish Republic of Northern Cyprus" November 15, 1983. The southern two-thirds of the island was controlled by the Government of the Republic of Cyprus. Since very little, if any, mineral activity took place in the northern one-third of the island, only the southern two-thirds sector was considered in this chapter.

Owing to the depletion of exploitable deposits, the mining sector continued to decline in importance. Since the midseventies, employment in the mining sector decreased by more than 40%. Mining's contribution to gross domestic product (GDP) dropped from 2.5% to 0.9%. Mineral export revenues fell, with significant declines noted in the exports of iron pyrites and asbestos. Although chromium exports did not decline significantly, a shrinkage can be expected to occur unless new deposits are discovered. A relatively new fertilizer plant near Limassol should increase the local demand for pyrites utilized by this plant.

The first phase of a feasibility study on using coal in Cyprus for generation of electricity was completed. If a conversion to coal were determined to be economically viable, a second study would be carried out to choose a new powerplant site. One local cement plant was already using coal. In addition to coal, Cyprus was studying other alternatives to imported oil for energy.

PRODUCTION AND TRADE

Mineral production data, as reported in the 1983 annual report of the Republic of Cyprus Mines Service, for the most part reflected an industry that has been in decline since 1970. The well-known copper mines were essentially exhausted by 1979; however, efforts have been increasing to extract cement copper from mine drainage waters and waste dump leach solutions. In 1983, there was no mine production of chromite as export shipments of 11,000 tons of chrome ore to Austria and Greece were drawn from company stocks. Asbestos production has been cut in half since 1980, and output of sulfur-bearing pyrites continued on a downward trend. Among the industrial minerals, production of crushed limestone (havara), aggregate, marble, brick clay, crude gypsum, and bentonite were all up from 1982 levels, while output of hydrated lime, and umber declined.

Cyprus had a balance-of-trade deficit of $722 million[2] in 1983, which was 33% above that of 1982. Yet, despite the deteriorating balance of trade, the current-account deficit was only slightly worse than in 1982, rising from $137 million in 1982 to $170 million in 1983.

Mineral exports valued at $10.8 million in 1983, represented 3% of total exports compared with 35% of total exports in 1970. Asbestos continued to be the major mineral export in 1983 as Cyprus Asbestos Mines Ltd. exported 5,160 tons of long-fiber asbestos valued at $2.6 million to Belgium, Egypt, and other countries and 8,510 tons of short-fiber asbestos valued at $3.4 million chiefly to the United Kingdom, India, and Thailand.

Mineral pigments, valued at $1.6 million, and bentonite and chrome ore, each valued at about $1 million, were the other major exports.

Cyprus produced no crude mineral fuels in 1983, while importing 3.5 million barrels of crude oil valued at $106 million. Iraq (71%) and Libya (19%) were the major suppliers.

Table 1.—Cyprus: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Chromium ore and concentrate, marketable	15,742	16,280	10,381	2,878	[3]--
Copper:					
Mine output, metal content[4]	1,200	--	--	--	[3]--
Cement copper	--	--	470	1,530	[3]2,088
NONMETALS					
Asbestos, fiber produced	35,472	34,397	25,568	18,952	[3]17,288
Cement, hydraulic thousand tons	1,135	1,233	1,035	1,068	[3]943
Clays, crude:					
Bentonite	5,300	[r]24,000	47,000	13,000	[3]32,000
Other:					
For brick and tile manufacture thousand tons	371	380	165	187	[3]230
For cement manufacture do.	274	276	253	250	250
Total do.	645	656	418	437	480
Gypsum:					
Crude	46,100	43,550	40,000	30,000	[3]32,000
Calcined	15,300	17,850	23,000	25,000	[3]10,000
Lime, hydrated	[e]18,000	[r]18,500	12,920	11,900	8,500
Mineral pigments:					
Umber	26,000	[r]27,000	20,000	[3]20,000	[3]16,000
Yellow ocher	293	200	250	--	--
Total	26,293	[r]27,200	20,250	20,000	16,000
Pyrites	45,987	[r]61,752	15,866	55,525	[3]46,665
Salt, marine	5,870	7,462	9,299	9,857	[3]--
Stone, sand and gravel:					
Dimension stone: Marble	52,700	66,200	56,000	75,000	[3]90,000
Crushed and broken stone:					
Havara (crushed limestone) thousand tons	1,980	[r]5,100	4,350	3,475	[3]4,500
Limestone:					
For cement production do.	993	1,073	1,039	1,000	NA
Other	[e]20,000	13,984	11,320	10,000	NA
Marl, for cement production	633,000	600,000	565,387	550,000	533,970
Unspecified building stone	87,100	[r]105,000	760,000	980,000	[3]500,000
Sand and aggregate thousand tons	5,075	[r]4,700	3,857	3,975	[3]4,100
Sulfide concentrates containing precious metals	--	[r]376	514	116	--
Sulfur, S content of marketable pyrites	20,837	24,885	9,478	[e]25,500	21,430
MINERAL FUELS AND RELATED MATERIALS					
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	850	857	813	805	890
Jet fuel and kerosine do.	296	434	434	377	468
Distillate fuel oil do.	986	1,141	1,036	1,019	1,147
Residual fuel oil do.	1,334	1,415	988	1,068	1,101
Other:					
Liquefied petroleum gas do.	256	239	215	193	227
Asphalt do.	110	100	148	136	165
Unspecified do.	32	3	4	--	--
Refinery fuel and losses do.	198	188	220	229	207
Total do.	4,062	4,377	3,858	3,827	4,205

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through July 1, 1984.

[2] In addition to the commodities listed, a variety of other crude construction materials are produced, but available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

[4] Includes the nonduplicative sum of Cu content of all exportable products including copper concentrates, cuprous pyrites, cement copper, and copper precipitates.

Table 2.—Cyprus: Exports and reexports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981[r]	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys: Scrap	266	269	--	Netherlands 176; Japan 34; West Germany 29.
Chromium: Ore and concentrate	10,520	11,681	--	United Kingdom 6,466; Spain 3,740; Italy 1,475.
Copper:				
Matte and speiss including cement copper	--	1,979	--	U.S.S.R. 1,044; Spain 935.
Metal including alloys: Scrap	601	396	--	Greece 102; United Kingdom 86; Belgium-Luxembourg 70.
Iron and steel: Metal:				
Scrap	8,311	7,225	--	Greece 5,310; Italy 1,904.
Semimanufactures:				
Bars, rods, angles, shapes, sections	492	678	--	Saudi Arabia 586; Lebanon 52; Egypt 29.
Wire	8	97	--	All to Lebanon.
Tubes, pipes, fittings	114	253	--	Lebanon 113; Syria 63; Libya 31.
Unspecified value	$547	--		
Lead:				
Oxides	68	76	--	Saudi Arabia 70; Greece 6.
Metal including alloys: Scrap	149	59	--	All to India.
Silver: Ore and concentrate value, thousands	$3,095	$711	--	All to West Germany.
Zinc: Metal including alloys:				
Scrap	70	106	--	Spain 67; Belgium-Luxembourg 20; West Germany 19.
Semimanufactures value, thousands	$3	--		
NONMETALS				
Asbestos, crude	28,622	18,813	--	Saudi Arabia 2,627; Ireland 2,587; Thailand 2,333.
Cement	494,583	510,597	--	Spain 278,173; Iraq 101,979; Egypt 66,949.
Clays, crude: Unspecified	25,699	17,259	--	Oman 5,844; Egypt 4,201; Nigeria 3,445.
Diamond: Gem, not set or strung value, thousands	$35	$15	--	All to Switzerland.
Fertilizer materials: Manufactured:				
Unspecified and mixed	--	90	--	Saudi Arabia 72; United Kingdom 17; United Arab Emirates 1.
Gypsum and plaster	5,601	7,509	--	Saudi Arabia 6,509; Egypt 510; Bahrain 297.
Pigments, mineral:				
Natural crude	8,171	5,578	NA	NA.
Iron oxides and hydroxides, processed	--	2	--	All to Oman.
Precious and semiprecious stones other than diamond: Natural value, thousands	$7	$27	--	Lebanon $22; Israel $3; United Kingdom $1.
Pyrite, unroasted	35,107	1,082	--	All to West Germany.
Stone, sand and gravel:				
Dimension stone: Crude and partly worked	36	32	--	All to Saudi Arabia.
Gravel and crushed rock	44	405	--	Israel 385; Saudi Arabia 20.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	93	23	--	All to Lebanon.
Gasoline: Motor do	34,088	27,455	NA	NA.
Mineral jelly and wax do	--	150	--	All to Lebanon.
Kerosine and jet fuel do	408,606	544,314	NA	NA.
Distillate fuel oil do	79,920	11,972	--	United Kingdom 224; Lebanon 104.
Lubricants do	3,289	2,674	--	Lebanon 126; United Kingdom 14.
Residual fuel oil do	43,217	65,681	NA	NA.

[r] Revised. NA Not available.

[1] Table prepared by Virginia A. Woodson.

Table 3.—Cyprus: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981[r]	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Semimanufactures	2,693	3,908	5	Greece 1,572; France 429; Italy 376.
Cobalt: Oxides and hydroxides	10	--		
Copper:				
Sulfate	22	--		
Metal including alloys:				
Unwrought	50	17	--	United Kingdom 16.
Semimanufactures	519	908	30	Greece 275; United Kingdom 120; Yugoslavia 118.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	18,087	--		
Iron and steel: Metal:				
Scrap	23	40	--	All from United Kingdom.
Pig iron, cast iron, related materials	1,020	683	--	Bulgaria 500.
Ferroalloys:				
Ferromanganese	--	40	--	West Germany 30; France 10.
Unspecified	58	--		
Semimanufactures:				
Bars, rods, angles, shapes, sections	59,056	83,309	975	Spain 14,731; West Germany 12,188; Argentina 7,978.
Universals, plates, sheets	19,342	17,840	--	Greece 5,134; West Germany 4,096; Italy 2,438.
Hoop and strip	3,020	5,409	(2)	Greece 3,809; West Germany 1,061; Hungary 110.
Rails and accessories	--	110	--	All from United Kingdom.
Wire	2,919	3,650	1	Hungary 1,059; United Kingdom 905; Belgium-Luxembourg 642.
Tubes, pipes, fittings	13,665	16,845	2	Greece 5,718; Hungary 2,274; France 2,157.
Lead:				
Oxides	23	46	--	United Kingdom 40; France 6.
Metal including alloys:				
Unwrought	27	153	--	United Kingdom 89; Denmark 61.
Semimanufactures	695	1,063	250	United Kingdom 313; Denmark 226; Ireland 78.
Manganese: Oxides	7	28	--	Belgium-Luxembourg 18; West Germany 10.
Nickel: Metal including alloys, all forms	6	16	--	Italy 10; West Germany 4; Canada 1.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, unspecified troy ounces	744	3,342	(3)	NA.
Silver:				
Ore and concentrate value thousands	--	$9	--	All from Australia.
Metal including alloys, unwrought and partly wrought troy ounces	128,628	197,267	(4)	NA.
Tin: Metal including alloys: Semimanufactures	[5]3	5	--	United Kingdom 3; Denmark 2.
Titanium: Oxides	411	493	--	United Kingdom 306; Finland 86.
Vanadium: Ore and concentrate[6]	10	110	--	All from Australia.
Zinc:				
Oxides	12	31	--	West Germany 21; Belgium-Luxembourg 8; France 1.
Metal including alloys:				
Unwrought	50	280	--	Zaire 200; Belgium-Luxembourg 58.
Semimanufactures value	$78,359	$5	--	Greece $3; United Kingdom $2.
Other:				
Ores and concentrate	87	55	--	All from Australia.
Oxides and hydroxides	--	54	NA	NA.
Base metals including alloys, all forms value	--	$2,562	NA	NA.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones value, thousands	$200	$272	$5	Italy $75; West Germany $62; Japan $33.
Asbestos, crude	360	367	--	Zimbabwe 262; Republic of South Africa 105.
Barite and witherite	5	22	--	India 10; China 5; West Germany 3.
Cement	12,766	12,681	--	Greece 7,651; United Kingdom 2,416; Italy 1,062.
Chalk	997	769	--	United Kingdom 655; France 71; Greece 41.
Clays, crude	2,007	1,193	--	Greece 1,076; United Kingdom 97; France 7.
Diamond:				
Gem, not set or strung value	$630,970	$850	--	United Kingdom $379; Israel $242; Belgium-Luxembourg $121.
Industrial do	$19,037	$253	NA	NA.

See footnotes at end of table.

Table 3.—Cyprus: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981[r]	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Diatomite and other infusorial earth	121	196	134	West Germany 61.
Feldspar, fluorspar, related materials	20	41	--	West Germany 40.
Fertilizer materials:				
Crude, n.e.s	92	--		
Manufactured:				
Ammonia	33	38	--	Netherlands 18; West Germany 8; United Kingdom 7.
Nitrogenous	16,226	13,760	2	Greece 3,001; Austria 2,951; Italy 2,500.
Phosphatic	18	1,766	--	Lebanon 1,000; Romania 700; Israel 25.
Potassic	671	2,195	--	Spain 1,520; Israel 604; Bulgaria 20.
Unspecified	13,488	25,912	61	Romania 10,507; Italy 4,001; Spain 4,001.
Gypsum and plaster	18	29	--	United Kingdom 17; West Germany 6; Italy 5.
Magnesite	130	129	1	Netherlands 108; West Germany 14; China 5.
Mica: Crude including splittings and waste	35	34	--	United Kingdom 21; India 10; Norway 3.
Nitrates, crude	--	50	--	All from France.
Phosphates, crude	18	20,071	--	Algeria 16,002; Argentina 4,051; Netherlands 17.
Pigments, mineral: Iron oxides and hydroxides, processed	52	42	--	United Kingdom 30; Belgium-Luxembourg 6.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$361	$369	--	West Germany $108; United Kingdom $81; Thailand $68.
Synthetic value	$4,763	$47	--	Switzerland $41; United Kingdom $3.
Salt and brine	674	693	--	Netherlands 303; United Kingdom 184; West Germany 140.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	1,508	586	--	United Kingdom 199; Romania 150; France 182.
Sulfate, manufactured	1,080	1,512	--	Austria 775; West Germany 377; Greece 201.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	2,565	3,533	1	Italy 2,295; Greece 122; Portugal 20.
Worked value, thousands	$413	$505	--	Italy $371; Greece $82; Pakistan $21.
Gravel and crushed rock	1,609	1,065	--	Italy 899; Greece 163.
Sand other than metal-bearing	601	581	--	West Germany 363; Belgium-Luxembourg 121.
Sulfur:				
Elemental: Crude including native and byproduct	1,558	1,905	--	Lebanon 1,262; Poland 334; Greece 305.
Sulfuric acid	402	1,463	--	Italy 1,030.
Talc, steatite, soapstone pyrophyllite	144	270	--	Greece 138; Norway 62; Italy 26.
Other: crude	864	2,241	--	Greece 2,234; United Kingdom 4.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	7	27	--	West Germany 26; Netherlands 1.
Coal:				
Anthracite and bituminous	92	4,117	4,031	West Germany 45; Belgium-Luxembourg 40.
Briquets of anthracite and bituminous coal	40	40	--	All from West Germany.
Coke and semicoke	220	270	--	West Germany 120; France 100; Belgium-Luxembourg 50.
Peat including briquets and litter	713	727	--	West Germany 646; Ireland 35; Sweden 15.
Petroleum:				
Crude thousand 42-gallon barrels	4,302	3,749	--	Iraq 3,095; Libya 654.
Refinery products:				
Liquefied petroleum gas do	182	200	--	Greece 100; Libya 50; Saudi Arabia 32.
Gasoline: Motor do	1	80	--	Italy 47; France 25; Romania 6.

See footnotes at end of table.

Table 3.—Cyprus: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981[r]	1982	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Mineral jelly and wax thousand 42-gallon barrels	3	3	(2)	Hungary 1; Spain 1.
Kerosine and jet fuel ___do____	338	460	--	Greece 228; Italy 123; France 104.
Distillate fuel oil _____do____	120	163	--	Italy 74; France 44; U.S.S.R. 44.
Lubricants __________do____	41	[7]49	1	Belgium-Luxembourg 18; United Kingdom 13.
Residual fuel oil______do____	1,917	2,574	--	Syria 1,459; U.S.S.R. 455; Italy 398.
Bituminous mixtures___do____	3	4	(2)	Greece 2; United Kingdom 1.

[r] Revised. NA Not available.

[1] Table prepared by Virginia A. Woodson.

[2] Less than 1/2 unit.

[3] Value only reported at $2,000.

[4] Value only reported at $37,000.

[5] Excludes unreported quantity valued at $8,000.

[6] May include molybdenum ore and concentrate.

[7] Excludes unreported quantity valued at $155,616.

COMMODITY REVIEW

METALS

Chromite.—The Hellenic Mining Co. Ltd. (Helco) produced no chromite during the year. However, Helco continued an active exploration program for chromite on its Kannouros and Kokkinorotsos mining leases under cooperative agreement with the French Bureau de Recherches Géologiques et Minières.

NONMETALS

Asbestos.—Cyprus Asbestos Mines Ltd. quarried 2 million tons of rock in 1983, 33% less than in 1982. Its mill at Amiandos treated 1.6 million tons of ore, which yielded 7,518 tons of long-grade fibers and 3,770 tons of short-grade fibers. Yearend stocks included 4,962 tons of long-grade and 3,745 tons of short-grade asbestos fibers.

Cement.—Two cement companies were in operation during the year. Cyprus Cement Co. Ltd. produced 293,548 tons of clinker and 315,585 tons of cement, while Vassiliko Cement Works Ltd. produced 562,750 tons of clinker and 627,200 tons of cement, 56% of which was sold locally.

Clays.—*Bentonite.*—Cyprus actively sought a joint venture partner to help develop the island's extensive bentonite deposits. The deposits are estimated to contain over 10 million tons and are located 16 kilometers from the port city of Limassol. Boreholes have been drilled up to 100 meters deep in the deposit. After mining, the bentonite would require chemical and mechanical upgrading. The major producer, Peletico Plasters Ltd., quarried 26,000 tons of crude bentonite, processed 10,000 tons at its plant and exported 16,000 tons. Bendex Minerals Co. Ltd. and ELEPEM Ltd. were lesser volume producers of bentonite.

Fertilizer Materials.—Hellenic Chemical Industries Ltd. (HCL) successfully commissioned its new phosphoric acid and complex fertilizer plants in March, at Vassiliko. The 180,000-ton-per-year complex fertilizer unit produced compound grades of 16-20-0, 18-18-0, and 12-20-7 phosphate, potassium, and nitrogen, respectively, and some diammonium phosphate (18-46-0) since startup, but future grades were to be varied. The 40,000-ton-per-year, P_2O_5 hemihydrate phosphoric acid unit was operated at design capacity using Algerian phosphate rock and sulfuric acid from HCL's captive plant. This was the only fertilizer complex in Cyprus and supplied the domestic market with 160,000 tons of fertilizer annually.

Raw materials for the sulfuric acid plant come primarily from domestic pyrite deposits. In 1983, Helco mined 41,281 tons of pyritic ore from its Mathiatis Mine while purchasing an additional 51,351 tons of pyritic ore from the Kampia Mines Ltd. stockpile. Approximately 68% of this combined tonnage was consumed locally. An additional 11,030 tons of pyrite averaging 45.3% sulfur was exported to Italy and the Federal Republic of Germany.

MINERAL FUELS

Petroleum.—Cyprus Petroleum Refinery Ltd. produced a small range of refined petroleum products, all from imported crude oil. However, production from the refinery was insufficient to meet domestic demand, and petroleum products companies were using special permits from the Ministry of Commerce and Industry to import refined petroleum products. Reportedly, the costs for imported refined petroleum products were less than those for petroleum products refined at the Cyprus refinery, which had experienced some shutdowns during the year. Tentative plans were made to repair the refinery in order to meet the Cypriot market needs for petroleum products.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Cyprus pounds (£C) to U.S. dollars at the rate of £C1= US$1.90.

The Mineral Industry of Czechoslovakia

By Tatiana Karpinsky[1]

In 1983, Czechoslovakia was an important producer of coal, graphite, magnesite, and steel. Mineral industry production continued at about the same level of output as that of 1982, in accordance with the State Economic Plan. The main tasks of the plan in the mineral industry were reported fulfilled.[2] Successful prospecting and exploration programs promised an increase of minerals and ores in the future, particularly of bituminous coal in central Bohemia, tin-tungsten ore in the Krutnahory Mountains, and mercury in Slovakia. A number of new facilities were brought into production during the year including the May Day coal mine in Darkov, underground gas reservoir in Pribor and Lab, an iron foundry in Krnov, a semilight section mill in Kunice, and a cement combine in Zahorie.

Mining and quarrying contributed about 4% of the total industrial production. Of this total, coal represented 3%, metal ores including iron and nonferrous metals, about 0.4%; and other mining, including a small petroleum production, about 0.6%. Petroleum refining chiefly of imported petroleum contributed 3.5%; the iron and steel industry, 9.0%; and the nonferrous metal fabrication, 2.2%. In 1982, the total number of workers and employees was about 14.2 million including about 460,000 in mineral and energy enterprises, as shown in the following table.[3]

Branch	Number of workers (thousands)	Number of other employees (thousands)	Number of enterprises
Fuel extraction and processing industry	185	124	55
Power and heat generation	60	29	29
Ferrous metallurgy including ore mining	170	95	14
Nonferrous metallurgy including ore mining	41	20	19

Czechoslovakia continued to participate in many East European multilateral investment projects: particularly, the development of coal mining in Poland and in Mongolia; construction of oil and natural gas pipelines in the U.S.S.R.; development of molybdenum, tin, and tungsten industries in Mongolia; renovaton of the zinc plant in Poland; and development of nickel and titanium plants in the U.S.S.R. Czechoslovakia participated also in developing the ferroalloy industry in Bulgaria and the copper industry in Mongolia, Poland, and the U.S.S.R.

Government Policies and Programs.—The Plenum of the Communist Party of Czechoslovakia Central Committee on November 23-24, 1983, outlined the Report on State Plan for Economic and Social Development for 1984. The plan assumed further increases in the rate of economic growth. Gross national income was planned to increase by 3% or by 15.7 billion korunas (Kcs);[4] this was in comparison with growth of 0.5% in 1982 and 2.2% in 1983. Labor productivity was planned to increase by 2.6%. Industrial production was to increase by 2.9%. Slowdowns were planned in fuel and energy and in industries based on imported raw materials. The decline in metallurgy was expected to be 0.6%.

PRODUCTION

In ferrous metallurgy production increased by 1%, in the nonferrous industry by 1.6%, and in ore mining by 2%. The production of steel, rolled steel, and thin sheets slightly increased. High production increases were reported with respect to some petroleum products, and production of nitrogen fertilizer increased by about 4%. All coal basins reportedly fulfilled their annual extraction plans. Total electric energy consumption increased by 2.7%, and the unrevealed plan for electric energy production was supposedly fulfilled.

Table 1.—Czechoslovakia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum:					
Alumina[e]	100,000	100,000	100,000	100,000	100,000
Aluminum ingot, primary only	36,889	38,304	32,684	33,830	33,800
Antimony, mine output, metal content	530	530	[e]500	[e]500	500
Copper:					
Mine output, metal content	6,180	6,639	5,218	5,200	5,200
Metal:					
Smelter, primary only	8,180	7,600	7,400	7,400	7,400
Refined including secondary	24,587	25,559	25,513	25,636	25,600
Iron and steel:					
Iron ore:					
Gross weight thousand tons	2,012	1,969	1,935	1,861	1,800
Metal content do.	[r]532	512	502	483	470
Metal:					
Pig iron do.	9,529	9,819	9,393	9,069	[2]9,466
Ferroalloys: Electric furnace do.	175	173	173	164	160
Steel, crude do.	14,817	15,225	15,270	14,992	[2]15,024
Semimanufactures do.	12,317	12,302	12,323	12,193	[2]10,732
Lead:					
Mine output, metal content	4,026	3,349	3,400	3,470	3,450
Metal including secondary	19,020	20,014	20,663	21,071	21,000
Manganese ore, gross weight[e] [3]	900	900	900	900	900
Mercury 76-pound flasks	4,960	6,236	8,383	8,299	8,300
Nickel metal, primary	2,202	2,241	[e]2,200	2,200	2,200
Silver[e] thousand troy ounces	1,300	1,300	1,300	1,300	1,300
Tin:					
Mine output, metal content	180	322	433	443	440
Metal including secondary	120	215	289	295	300
Tungsten: Mine output, metal content[e]	80	80	50	50	50
Zinc:					
Mine output, metal content	8,799	7,239	6,790	6,929	7,000
Metal including secondary	11,500	9,600	9,004	9,184	9,100
NONMETALS					
Barite	67,800	61,052	[e]61,000	[e]61,000	61,000
Cement, hydraulic thousand tons	10,258	10,546	10,646	10,325	[2]10,498
Clays: Kaolin do.	513	518	508	527	520
Fluorspar[e] do.	96	96	96	96	96
Graphite[e] do.	45	45	45	45	45
Gypsum and anhydrite, crude do.	734	757	767	794	800
Lime, hydrated, and quicklime do.	2,968	3,018	3,234	3,088	[2]1,100
Magnesite, crude do.	654	666	664	672	670
Nitrogen: N content of ammonia do.	801	844	[e]850	[e]850	850
Perlite	30,000	40,302	42,336	[e]42,000	42,000
Pyrite, gross weight[e] thousand tons	140	140	140	140	140
Salt do.	271	277	311	227	230
Sodium compounds:					
Caustic soda do.	312	325	331	330	300
Sodium carbonate, manufactured do.	119	123	118	106	100
Stone:					
Limestone and other calcareous stone do.	23,209	23,884	24,155	23,818	23,800
Quarry stone, not further described thousand cubic meters	35,280	36,499	36,220	[e]36,200	36,200

See footnotes at end of table.

Table 1.—Czechoslovakia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Sulfur:[e]					
Native thousand tons	5	5	5	5	5
From pyrites do	60	60	60	60	60
Byproduct, all sources do	10	10	10	10	10
Total do	75	75	75	75	75
Sulfuric acid do	1,253	1,284	1,317	[e]1,700	1,700
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Bituminous thousand tons	27,967	27,710	27,007	27,463	[2]26,915
Brown and lignite do	96,932	95,726	96,365	98,504	[2]100,470
Coke:					
Metallurgical do	8,569	8,611	8,575	[e]8,500	8,440
Unspecified do	1,889	1,712	1,748	[e]1,900	1,900
Fuel briquets from brown coal do	1,117	1,159	1,069	[e]1,100	1,100
Gas:					
Manufactured, all types million cubic feet	275,983	274,360	268,639	[e]270,000	270,000
Natural, marketed[e] [4] do	26,000	26,000	26,000	26,000	26,000
Petroleum:					
Crude:					
As reported thousand tons	108	93	89	[e]90	90
Converted thousand 42-gallon barrels	732	629	603	[e]602	602
Refinery products[5] do	125,005	122,842	120,311	NA	NA

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[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through May 23, 1984. In addition to the commodities listed, arsenic, gold, uranium, feldspar, graphite, and a variety of other petroleum products are produced, but information is inadequate to make reliable estimates of output levels.

[2]Reported figure.

[3]This material, although reported as manganese ore, is believed to be manganiferous iron ore with a manganese content of about 17% and as such is not equivalent to material ordinarily reported as manganese ore, which generally contains 25% or more manganese.

[4]Includes gas produced from coal mines. Gross output of natural gas is not reported, but it is believed to exceed reported marketed output by a relatively inconsequential amount.

[5]Data presented are for those products reported in official Czechoslovak sources and in United Nations publications; no estimates have been included for other products or for refinery fuel and losses.

TRADE

The main Czechoslovak trading partner was the U.S.S.R. with 40% of the total. The Czechoslovak economy relied on cooperation with the U.S.S.R. and the mutual trade turnover rose according to plan. The second largest commercial partner of Czechoslovakia was the German Democratic Republic with more than 9% per share in the turnover of Czechoslovak foreign trade, followed by Poland with 6.3%. Czechoslovak foreign trade increased 9% compared with that of 1982. The country reportedly achieved a foreign trade balance.

In 1983, fuels, minerals, raw materials, and metals constituted 14% of the total export value and 42% of total import value. The main exports in this group were rolled stock, steel plates, tubes, coal, and coke. Major commodities of Czechoslovakia's imports were crude petroleum, petroleum products, natural gas, and large quantities of iron ore and nonferrous metals. Deliveries were mainly from the U.S.S.R. In the 1976-80 plan period, the U.S.S.R. supplied Czechoslovakia with about 660 million barrels of crude oil, 60 million tons of iron ore, 1 trillion cubic feet of natural gas, and 7 billion kilowatt hours of electric energy. The most important deliveries included equipment for the reconstruction of the No. 2 blast furnace at the East Slovakia iron and steel plant and equipment for the converter plant at the Trinec iron and steel plant.

Table 2.—Czechoslovakia: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982^{p}	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ash and residue containing aluminum	--	1,386	--	All to West Germany.
Metal including alloys:				
Scrap	3,565	7,312	--	Austria 5,362; West Germany 1,887.
Unwrought	8,420	15,102	--	Japan 10,533; Italy 1,571.
Semimanufactures	1,148	2,096	--	Poland 1,633; Hungary 420.
Copper:				
Ore and concentrate	536	517	--	All to United Kingdom.
Sulfate	1,553	1,867	--	West Germany 886; France 726.
Metal including alloys, all forms	798	377	--	West Germany 307.
Iron and steel:				
Iron ore and concentrate, including roasted pyrite	11,586	NA		
Metal:				
Scrap	102,718	95,191	--	Italy 67,240; Austria 16,885.
Pig iron, cast iron, related materials	3,509	2,862	--	Denmark 1,574; West Germany 980.
Ferroalloys:				
Ferrochromium	5,117	NA		
Ferromanganese	6,858	75	--	All to Austria.
Ferrosilicomanganese	14,752	10,718	--	West Germany 10,441.
Ferrosilicon	479	4,935	--	Austria 4,554.
Silicon metal	--	90	--	All to Netherlands.
Unspecified	5,017	6,395	--	Italy 2,241; United Kingdom 2,161.
Steel, primary forms[2] thousand tons	308	294	--	Yugoslavia 180; Italy 53.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	1,213	1,195	2	Egypt 263; West Germany 153; unspecified 638.
Universals, plates, sheets do	958	959	--	Poland 137; West Germany 88; France 86.
Hoop and strip do	208	148	--	West Germany 14; unspecified 116.
Rails and accessories do	37	31	--	NA.
Wire do	110	120	--	West Germany 16; unspecified 82.
Tubes, pipes, fittings[2] do	549	532	--	U.S.S.R. 385; East Germany 28.
Castings and forgings, rough do	22	43	--	Poland 31.
Unspecified do	446	[2]157	--	NA.
Lead:				
Ore and concentrate	5,749	5,664	--	All to West Germany.
Metal including alloys, scrap	88	394	--	Austria 243; West Germany 151.
Mercury 76-pound flasks	--	87	--	All to France.
Nickel: Metal including alloys, all forms	3	19	--	Netherlands 8; Austria 5.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, unspecified value, thousands	$432	$202	--	United Kingdom $201.
Silver:				
Waste and sweepings[3] do	$269	$536	--	United Kingdom $420; West Germany $85.
Metal including alloys, unwrought and partly wrought do	$3,021	$1,598	--	United Kingdom $1,041; West Germany $557.
Tin: Ore and concentrate	47	151	--	All to United Kingdom.
Titanium: Oxides	772	1,879	--	Italy 753; West Germany 460; United Kingdom 360.
Zinc:				
Ore and concentrate	13,648	3,888	--	Belgium-Luxembourg 1,864; Austria 1,216.
Oxides	204	1,218	--	Norway 985; West Germany 100.
Ash and residue containing zinc	4,044	3,878	--	All to West Germany.
Metal including alloys, all forms	208	NA		
Other:				
Oxides and hydroxides	35	2,578	--	All to Austria.
Ashes and residues	1,105	2,552	--	Austria 2,532.
Base metals including alloys, all forms	[4]26	4	--	West Germany 2; United Kingdom 2.
NONMETALS				
Abrasives, n.e.s.:				
Artificial:				
Corundum	4,248	4,789	--	Italy 3,189; West Germany 826; Netherlands 601.
Silicon carbide	616	1,119	--	West Germany 738; Finland 200.
Grinding and polishing wheels and stones[5]	506	407	NA	West Germany 158; Thailand 72.
Barite and witherite	1,258	2,230	--	Austria 2,218.

See footnotes at end of table.

Table 2.—Czechoslovakia: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Cement[2] thousands tons	429	350	--	West Germany 124; Hungary 112; Yugoslavia 62.
Clays, crude:				
Andalusite, kyanite, sillimanite	24,718	NA		
Chamotte earth	145,028	118,494	--	Hungary 67,448; West Germany 35,888.
Fire clay	73,160	29,078	--	All to West Germany.
Kaolin[2]	347,000	369,000	--	West Germany 128,000; Poland 76,000; Yugoslavia 37,000.
Unspecified	136,659	179,579	--	West Germany 109,898; Austria 32,364; Hungary 26,798.
Diatomite and other infusorial earth	1,244	2,058	--	All to Austria.
Feldspar, fluorspar, related materials	300	316	--	Do.
Fertilizer materials: Manufactured:				
Ammonia	15,771	752	--	All to West Germany.
Nitrogenous	103,918	34,934	--	West Germany 21,845; Italy 9,485.
Potassic	3,146	2,900	--	All to United Kingdom.
Unspecified and mixed	435	22,980	--	Austria 22,920.
Graphite, natural	1,573	1,000	--	All to Poland.
Lime	9,891	5,401	--	West Germany 3,987.
Magnesium compounds:				
Magnesite[2] thousand tons	305	303	--	Hungary 74; Poland 65; West Germany 55.
Other	--	560	--	All to France.
Mica: Worked including agglomerated splittings	94	25	--	Austria 13; United Kingdom 6.
Nitrates, crude	--	252	--	All to Italy.
Pigments, mineral: Iron oxides and hydroxides, processed	1,062	383	--	Italy 280; Egypt 103.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$42	$10	--	Netherlands $7; Switzerland $3.
Synthetic do	$39	NA		
Salt and brine	101	93	--	Finland 90.
Sodium compounds, n.e.s.: Carbonate, manufactured	[6]5,900	12,039	--	West Germany 11,822.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,543	5,230	--	Italy 3,445; West Germany 1,419.
Worked	7,850	10,354	--	West Germany 10,283.
Gravel and crushed rock	8,949	13,498	--	West Germany 6,988; Austria 6,510.
Limestone other than dimension	20,338	16,717	--	All to West Germany.
Sand other than metal-bearing	262,078	261,902	--	Austria 164,686; Hungary 97,192.
Sulfur:				
Elemental:				
Crude including native and byproduct	26	40	--	All to Austria.
Colloidal, precipitated, sublimed	--	27	--	All to Kuwait.
Sulfuric acid	[6]9,000	NA		
Talc, steatite, soapstone, pyrophyllite	6,395	6,670	--	All to Poland.
Other:				
Crude	24,368	97,097	--	Hungary 84,948; West Germany 6,703.
Slag and dross, not metal-bearing	17,171	20,670	--	West Germany 20,648.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	--	36	--	West Germany 34.
Coal:				
Anthracite and bituminous[2] thousands tons	2,605	2,822	--	Austria 825; East Germany 538.
Lignite including briquets[2] do	2,527	2,710	--	West Germany 2,662.
Coke and semicoke[2] do	1,263	1,371	--	East Germany 582; Austria 310.
Gas, natural: Gaseous million cubic feet	[6]1,201	879	--	All to Austria.
Petroleum:				
Crude thousand 42-gallon barrels	1,417	NA		
Refinery products, unspecified do	11,041	7,026	--	West Germany 2,966; Austria 2,245.

[p] Preliminary. NA Not available.

[1] Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Czechoslovakia, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from various sources, which include United Nations information and data published by the partner trade countries.

[2] Official trade statistics of Czechoslovakia.

[3] May include other precious metals.

[4] Excludes quantity valued at $46,000.

[5] Excludes quantity valued at $445,080 in 1981 and $189,000 in 1982 including imports of United States valued at $94,000 in 1982.

[6] Statistical Yearbook of Member States of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

Table 3.—Czechoslovakia: Apparent imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate[2] thousand tons	454	474	--	Hungary 305; Yugoslavia 169.
Oxides and hydroxides	32,259	16,362	--	Hungary 16,198.
Metal including alloys:				
Scrap	518	1,821	--	Austria 1,161; West Germany 584.
Unwrought[2] thousand tons	82	66	--	U.S.S.R. 55; Yugoslavia 9.
Semimanufactures	15,988	1,828	--	Hungary 1,115; West Germany 317.
Cadmium: Metal including alloys, all forms[2]	228	220	--	Finland 55; Japan 55.
Chromium:				
Ore and concentrate[2] thousand tons	180	204	--	U.S.S.R. 146; Albania 26.
Oxides and hydroxides	683	86	--	Poland 84.
Metal including alloys, all forms	15	20	--	All from Belgium-Luxembourg.
Cobalt:				
Oxides and hydroxides	10	5	--	France 3.
Metal including alloys, all forms	40	39	--	Finland 30; France 9.
Copper:				
Ore and concentrate	2,300	1,404	--	All from Finland.
Metal including alloys:				
Scrap	632	886	--	West Germany 595; Austria 291.
Unwrought[2] thousand tons	67	59	--	U.S.S.R. 39; Poland 7.
Semimanufactures	25,366	18,177	--	Poland 17,116.
Iron and steel:				
Iron ore and concentrate, excluding roasted pyrite[2] thousand tons	12,166	11,640	--	U.S.S.R. 9,888; Brazil 1,194.
Metal:				
Scrap	252,097	73,823	--	West Germany 45,553; U.S.S.R. 27,300.
Pig iron, cast iron, related materials[2]	843,000	901,000	--	U.S.S.R. 900,000.
Ferroalloys:				
Ferrochromium	6,122	1,135	--	All from West Germany.
Ferromanganese	--	980	--	France 510; West Germany 470.
Silicon metal	2,239	50	--	All from West Germany.
Unspecified	3,407	2,244	--	United Kingdom 706; West Germany 674; Belgium-Luxembourg 473.
Steel, primary forms	20,000	16,000	--	NA.
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	172	183	--	NA.
Universals, plates, sheets do.	108	111	--	West Germany 17; unspecified 83.
Hoop and strip do.	23	25	--	West Germany 3; unspecified 18.
Rails and accessories do.	1	3	--	NA.
Wire do.	3	3	--	West Germany 1.
Tubes, pipes, fitting do.	16	32	--	West Germany 5; unspecified 20.
Castings and forgings, rough do.	12	14	--	NA.
Lead:				
Oxides	4,142	3,482	--	Austria 2,335; France 1,126.
Metal including alloys:				
Scrap	253	168	--	All from West Germany.
Unwrought[2] thousand tons	38	30	--	U.S.S.R. 15; Yugoslavia 8.
Lithium: Metal including alloys, all forms	260	12	--	West Germany 11.
Manganese:				
Ore and concentrate, metallurgical-grade[2] thousand tons	480	502	--	U.S.S.R. 285; Brazil 108.
Mercury 76-pounds flasks	2,001	29	--	All from Italy.
Molybdenum: Ore and concentrate	716	221	--	Netherlands 113; West Germany 108.
Nickel: Metal including alloys:				
Unwrought[2]	8,347	6,741	--	U.S.S.R. 3,387; United Kingdom 1,594.
Semimanufactures	43	48	--	West Germany 39.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, unspecified value, thousands	$1,793	$326	--	West Germany $281.
Silver: Metal including alloys, unwrought and partly wrought do.	$10,374	$209	--	Netherlands $151.
Tin: Metal including alloys, unwrought[2]	3,646	3,088	--	United Kingdom 1,255; Indonesia 1,055.
Titanium: Oxides	678	742	--	All from United Kingdom.
Tungsten: Ore and concentrate	52	52	--	All from Netherlands.
Vanadium: Oxides and hydroxides value, thousands	$1,199	$333	--	All from Finland.
Zinc:				
Oxides	645	288	--	All from United Kingdom.
Metal including alloys:				
Unwrought[2] thousand tons	63	57	--	Finland 13; Yugoslavia 10; U.S.S.R. 9.
Semimanufactures	7,772	1,475	--	Poland 1,468.
Zirconium: Ore and concentrate	--	2,156	--	All from West Germany.

See footnotes at end of table.

Table 3.—Czechoslovakia: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Other:				
Ores and concentrates	50,929	54,136	--	Norway 53,802.
Oxides and hydroxides	2,238	22,115	15	Austria 21,591.
Base metals including alloys, all forms	140	28	(3)	Austria 15; United Kingdom 4.
Nonferrous metals and alloys, rolled[2]	14,000	27,000	--	Yugoslavia 18,000; U.S.S.R. 9,000.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	725	655	--	Italy 652.
Artificial:				
Corundum	1,524	1,637	--	Hungary 1,550; West Germany 77.
Silicon carbide	--	293	--	All from Italy.
Dust and powder of precious and semiprecious stones including diamond value, thousand	$260	$326	$199	United Kingdom $127.
Grinding and polishing wheels and stones[4]	472	513	18	West Germany 276; Austria 155.
Asbestos, crude[2]	49,195	48,699	--	U.S.S.R. 35,443; Canada 8,964.
Barite and witherite	2,973	125	--	All from West Germany.
Boron materials:				
Crude natural borates	8,871	7,243	--	Netherlands 6,210; West Germany 1,033.
Oxides and acids	1,751	920	--	Italy 420; France 300.
Cement[2] thousand tons	58	57	--	East Germany 42; U.S.S.R. 10.
Chalk	1,603	1,217	--	France 671; Belgium-Luxembourg 355.
Clays, crude	7,597	16,021	(3)	Hungary 11,202; United Kingdom 4,025.
Diamond:				
Gem, not set or strung value, thousands	$24	$18	--	All from Belgium-Luxembourg.
Industrial do	$3,548	$2,330	--	Belgium-Luxembourg $1,135; United Kingdom $712.
Diatomite and other infusorial earth	348	515	--	Austria 212; France 155.
Feldspar, fluorspar, related materials	2,513	765	--	Finland 675.
Fertilizer materials:				
Crude, n.e.s	8,916	9,201	--	All from Austria.
Manufactured:				
Ammonia	4,952	1,960	--	All from Hungary.
Nitrogenous, N_2 content[2] thousand tons	112	105	--	All from U.S.S.R.
Phosphatic, P_2O_5 content do	[5]97	NA		
Potassic, K_2O content do	639	639	--	East Germany 487; U.S.S.R. 152.
Unspecified and mixed	15,174	20,373	--	Austria 20,370.
Graphite, natural	765	530	--	West Germany 179; Japan 126.
Gypsum and plaster[2] thousand tons	22	21	--	U.S.S.R. 20.
Magnesium compounds:				
Oxides and hydroxides	461	592	--	France 434; West Germany 158.
Other	438	284	--	Austria 248.
Mica:				
Crude including splittings and waste	195	141	--	Austria 135.
Worked including agglomerated splittings	33	9	--	All from Austria.
Phosphate, crude, P_2O_5 content[2] thousand tons	271	280	--	U.S.S.R. 160; Tunisia 27.
Pigments, mineral: Iron oxides and hydroxides, processed	1,525	1,288	--	West Germany 1,035.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$61	$70	--	West Germany $59.
Synthetic do	$65	$22	--	Switzerland $21.
Salt and brine	352,808	176,167	--	U.S.S.R. 150,037; Poland 21,028.
Sodium compounds, n.e.s.:				
Carbonate, manufactured[2] thousand tons	171	182	--	East Germany 70; Romania 47.
Sulfate, manufactured	--	1,938	--	All from Austria.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	14,218	1,365	--	Hungary 1,248.
Worked	[6]490	607	--	All from Italy.
Dolomite, chiefly refractory-grade	197	3,049	--	Poland 2,953.
Gravel and crushed rock	1,639	977	--	France 770; Austria 167.
Quartz and quartzite	3,215	1,765	--	West Germany 1,489.
Sand other than metal-bearing[7]	1,023	463	1	West Germany 229; Austria 188.

See footnotes at end of table.

Table 3.—Czechoslovakia: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Sulfur:				
Elemental:				
Crude including native and byproduct[2] thousand tons	537	503	--	Poland 485.
Colloidal, precipitated, sublimed	51	34	--	All from Italy.
Dioxide	632	364	--	All from West Germany.
Sulfuric acid[2]	42,122	71,731	--	U.S.S.R. 66,709.
Talc, steatite, soapstone, pyrophyllite	317	365	--	Belgium-Luxembourg 116; United Kingdom 80; Austria 76.
Other:				
Crude	8,605	9,060	--	Hungary 6,886; West Germany 1,290.
Slag and dross, not metal-bearing	2,278	1,414	--	Austria 1,337.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	44	50	--	All from West Germany.
Carbon: Carbon black[2]	31,878	22,555	2	U.S.S.R. 12,744; Romania 3,084.
Coal:[2]				
Anthracite and bituminous thousand tons	4,423	4,980	--	U.S.S.R. 3,261; Poland 1,673.
Lignite including briquets do	570	652	--	All from East Germany.
Coke and semicoke	[5]15,900	NA		
Gas, natural: Gaseous million cubic feet	301,729	318,714	--	U.S.S.R. 318,396.
Peat including briquets and litter	17	570	--	All from West Germany.
Petroleum:				
Crude thousand 42-gallon barrels	[5]135,975	NA		
Refinery products, unspecified do	6,819	648	(3)	Austria 240; Hungary 223.

[p] Preliminary. NA Not available.

[1] Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Czechoslovakia, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from various sources, which include United Nations information and data published by the partner trade countries.

[2] Official trade statistics of Czechoslavakia.

[3] Less than 1/2 unit.

[4] Excludes quantities valued at $182,000 in 1981 and $97,000 in 1982.

[5] Statistical Yearbook of Member States of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

[6] Excludes exports from Pakistan valued at $472,000.

[7] In addition, Hungary exported 291,041 cubic meters of construction sand in 1981 and 157,386 cubic meters in 1982 to Czechoslovakia.

COMMODITY REVIEW

METALS

Antimony.—Europe's sole cyclone reactor plant for antimony was operational at Vazscora in central Slovakia, with a projected annual production of 2,000 tons. The new facility will process all antimony-bearing ores in the country as a byproduct of mercury production.

Copper.—Production of copper ore was mainly from the Zlate Hory deposits in Moravia. Mining of copper continued also at Banska Stiavnica, about 140 kilometers northeast of Bratislava in Slovakia. A reconstructed shaft furnace was put into operation at the Krompachy copper refinery near Banska Stiavnica in August, increasing its capacity to 11,000 tons of copper per year.

Gold.—Workers of the Czech Geological Office were preparing to open several reactivated deposits, and detailed investigations were planned to be made of localities where gold had been mined in the past. Czechoslovakia's once active gold-mining region in the Jeseniky Mountains and Slovak Rudohori, which had not been in production since 1960, were the target of renewed interest in resuming gold production.

Iron and Steel.—Mining of iron ore from Rudnany, Nizna Slana, and other deposits in Slovakia continued. Production was expected to be increased at the Slovinsky enterprise at Nizna Slana and at the Rosnova enterprise where the ore contained silver. Imports of ore from the U.S.S.R. reached about 10 million tons. An agreement was signed on October 20, 1983, by the U.S.S.R. and Czechoslovakia during the 37th Council for Mutual Economic Assistance meeting in East Berlin for the construction in a joint venture of a facility in Krivoi Rog, U.S.S.R., that will include iron ore mining, preparation, and pelletization. Construction will take place from 1984 to 1990, and on completion the complex will produce 30 million tons of oxidized ferrous lump ore processed into 13 million tons of iron pellets. Czechoslovakia's contribution was set at 365 million rubles or 13.7% of the overall first estimate. When on-stream, the complex will ensure Czechoslovakia of over 1 million tons of iron in ore per year as repayment of the outlays.

The production of steel in 1983 was slightly above the 1982 level, and was planned to be about 250,000 tons lower in 1985 than in 1980. A new oxygen converter plant, built in cooperation with the U.S.S.R., and the third of its kind in Czechoslovakia, was put into operation at the Trinec steelworks in Northern Moravia in 1983. Its capacity will be about 650,000 tons of steel per year. Continuous casting was in use at the East Slovakia iron and steel enterprises in Kosice and at Podbrazova in Central Slovakia. A continuous caster unit was under construction at the Hrodek iron and steel enterprise near Rokycany in Western Bohemia. The Vitcovice plant at Ostrava, producing mainly sections and tubes, expanded its steelmaking capacity by the installation of new electric arc furnaces. Technica Guss Co., of the Federal Republic of Germany, was to supply a two-strand horizontal continuous caster to the Vitcovice steel plant. The caster can produce squares or rounds from 100 to 200 millimeters. One of the Vitcovice furnaces was closed down for general overhaul after producing 2,000 tons of iron per day for the last 12 years. Modernization and expansion was planned to produce large-diameter seamless tubes and a special range of medium-diameter seamless tubes.

Lead and Zinc.—Despite the closure of some old lead-zinc mines in Bohemia, such as Pribram, the output of ore remained at the previous level. The main production of ore came from the Horni Benesov, Kutna Hora, and Stare Ransko deposits in Bohemia and Banska Stiavnica in Slovakia. At Horni Benesov a new shaft will be deepened to 830 meters, which will allow production of 400,000 tons per year. The concentrates produced contain copper, lead, zinc, silver, and gold. The ore will be processed at a new hydrometallurgical enterprise in Bruntal.

Mercury.—A 500,000-ton deposit containing the chief mercury mineral, cinnabar, was found at Malachov near Banska Bystrica in Slovakia and preparations for exploitation were to begin shortly. It was expected that about 40,000 tons of ore would be produced annually.

NONMETALS

Kaolin.—Czechoslovakia continued to rank fourth in the world in production of washed kaolin, after the United States, the United Kingdom, and the U.S.S.R., and third in exports after the United Kingdom and the United States. About 360,000 tons of kaolin was exported, mainly to the Federal Republic of Germany, Poland, Yugoslavia, Austria, and Hungary.

The west Bohemian ceramic plant, at Kaznejov near Plzen, had at its disposal the biggest kaolin quarry in central Europe. The quarry produced 261,000 tons of kaolin, of which about one-half was exported. The minable deposits at Kaznejov were up to 120 meters thick with an overburden depth from 2 to 5 meters. In the Plzen area, including Kaznejov, deposits were estimated at 100 million tons suitable for the paper and rubber industry. The largest deposit of ceramic kaolin in Czechoslovakia, 25 million tons, was in Krasny Dvur.

Magnesite.—A general overhaul of one of the four tunnel furnaces at the Slovak magnesite enterprise at Lubenik was to be completed in February 1984. The repair was estimated at Kcs3.5 million.

MINERAL FUELS

Coal.—The North Bohemian opencast mines, the largest lignite basin in Czechoslovakia, fulfilled its 1983 coal extraction plan by delivering to large consumers and households 68 million tons of lignite; the target for production in 1985 was 71 million tons. The annual plan for the removal of 177 million cubic meters of overburden was also fulfilled. North Bohemia, lying north and west of Prague, accounted for more than 70% of total lignite production in Czechoslovakia. The lignite was used in industrial plants and thermal power stations that supplied more than one-third of the electrical energy for the country.

The last two coal-fired powerplants, at Melnic and Prunerov, were commissioned recently in northern Bohemia. Development of the opencast Vrsany Mine continued, and the first 600,000 tons of lignite was produced in 1982. The coal was sent by conveyer belt to the Smeral Mine from where it was dispatched to consumers. The new opencast mine was under development at Lomnice near Sokolov in Northern Bohemia, where the lignite was met at a depth of 30 meters and it was estimated to contain 18 million tons of lignite. General investment in North Bohemia during the 5-year plan (1981-85) was more than 50% above the level of the previous 5-year plan, although the extent of investment activity, as a whole, in Czechoslovakia was reduced.

In 1983, the Ostrava-Karvina Coalfield in Northern Moravia accounted for 88% total bituminous coal production and Kladno (west of Prague) accounted for 7%. More than 63% of the bituminous coal produced in Czechoslovakia was metallurgical quality. Coke production was approximately the same as that of 1982. Coal mining in the Ostrava-Karvina region continued to be in difficult geological conditions, and the cost of coal mining in this area was expected to rise in the near future. Reserves of 500 million tons of coking coal were proved at Frenstat, Northern Moravia. About 50 million tons of bituminous coal was discovered near Syrenov in Eastern Bohemia.

Gas.—The Czechoslovak transit gas pipeline system, the total length of which was 3,200 kilometers, conveyed more than 1,483 billion cubic feet of natural gas from the U.S.S.R. to seven European countries in 1983. By 1989, the annual capacity of the pipeline is to increase to 2.4 trillion cubic feet. For this reason construction of the 857-kilometer-long fourth line of the pipeline was started at the beginning of 1983. By yearend, pipes had been laid on 170 kilometers of the 440-kilometer-long "southern branch" of the fourth line. So far, Czechoslovakia has invested Kcs20 billion in the construction of the pipeline, but it has already received Kcs13 billion worth of Soviet natural gas as a fee for its conveyance. This fee is equivalent to approximately 70 billion cubic feet of natural gas per year.

Petroleum.—The largest bulk of Czechoslovakia's crude oil was imported from the U.S.S.R. About 602,000 barrels of crude oil was extracted on Czechoslovak territory, amounting to 0.5% of the amount the country consumed. By the end of the seventh 5-year plan (1981-85), production was to increase to 644,000 barrels. Intensive geological prospecting continued in the main oil-bearing Vienna Basin, on the boundary between Southern Moravia and the Western Slovak region. Despite the fact that oil has been extracted there for almost 70 years, exploratory drilling proved the presence of crude oil in further deposits.

Uranium.—There were no published figures on Czechoslovakia's uranium production, but western experts believed that it amounted to 2,000 to 3,000 tons per year; all of it was transported to the U.S.S.R. as uranium concentrate.

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[1] Physical scientist, Division of Foreign Data.

[2] Rude Pravo (Prague). Jan. 13, 1983, pp. 1, 3.

[3] Statistika Rocenka Ceskoslovenske Socialisticke Republiky (Statistical Annual of the Czechoslovakia Socialist Republic) (Prague). 1983, pp. 357-358.

[4] The Czechslovak koruna (Kcs) is not convertible, and the official exchange rate cannot be used as a measure of relative value. Values given in this chapter are therefore not converted to dollars. The average official exchange rate in 1983 was Kcs6.45=US$1.00.

The Mineral Industry of Denmark and Greenland

By Joseph B. Huvos[1]

DENMARK

Denmark had few known mineral resources of its own and was a significant importer of fuels and minerals, such as crude oil, natural gas, coal and coke, steel scrap, and metals. However, exploitation of raw materials included industrial minerals such as sand and gravel, chalk, clays, plus rock salt and oil. Greenland produced lead and zinc concentrates and cryolite. The Danish economy expanded more rapidly in 1983 than that of the rest of Western Europe, as Denmark's gross national product rose to $56 billion.[2] The unemployment rate was 10.6%.

Based on the Raw Materials Act of 1977, taxes paid on imported and exploited raw materials and goods manufactured therefrom were further increased from $0.035 to $0.05 per cubic meter of raw materials involved. Proceeds of the tax, about $1 million in 1981, increased in 1982 because of a rise in building activities. As previously, the Ministry for Environment remained responsible for enforcing the requirement that industry use efficient methods for exploiting and utilizing raw materials.

Important events in the mineral industry of Denmark included continued construction of the national gas pipeline, an increase of crude oil production on the Continental Shelf, modernization of Denmark's only commercial steel plant, and closing of an ammonia plant.

PRODUCTION

Increased crude oil production on the Continental Shelf led to an increase in the value of minerals produced. Production lagged, though, in the steel industry and for industrial minerals.

Table 1.—Denmark: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983[p]
Cement, hydraulic[2] ________ thousand tons__	2,412	1,917	1,602	[e]1,600	[e]1,400
Chalk[2]	123,654	[e]120,000	112,028	[e]100,000	[e]100,000
Clays: Kaolin, crude and washed[e]	20,000	20,000	20,390	30,000	22,000
Diatomaceous materials:					
Diatomite	[e]25,000	[e]25,000	3,465	--	--
Moler[e]	125,000	125,000	125,000	125,000	137,000

See footnotes at end of table.

Table 1.—Denmark: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983[p]
Iron and steel:					
Iron ore (less than 42% Fe), gross weight thousand tons	8	8	[e]8	[e]8	--
Metal content of ore do.	4	3	3	[e]3	--
Steel, crude[3] do.	804	734	612	560	493
Semimanufactures do.	[4]683	[4]655	552	455	400
Lead metal including alloys, secondary	29,800	24,500	26,500	20,000	10,000
Lime, agricultural and quicklime[2] thousand tons	177	170	195	[e]195	[e]200
Nitrogen: N content of ammonia	32,900	31,200	31,200	30,700	11,700
Peat, agricultural[2] thousand tons	45	31	33	94	[e]100
Petroleum:					
Crude thousand 42-gallon barrels	3,313	2,272	5,815	12,929	15,120
Refinery products:					
Gasoline do.	12,410	9,367	9,852	8,475	10,548
Jet fuel do.	730	80	48	176	264
Kerosine do.		202	101	233	78
Distillate fuel oil do.	27,740	20,821	19,926	19,389	22,358
Residual fuel oil do.	18,980	14,099	11,995	11,875	13,280
Other do.	[r]4,210	[r]3,272	[2]3,095	2,795	3,073
Refinery fuel and losses do.	[r]2,533	[r]2,053	2,287	1,869	1,993
Total do.	[r]66,603	[r]49,894	47,304	44,812	51,594
Salt[2] thousand tons	380	[e]380	398	447	412
Stone, sand and gravel:[2]					
Dimension stone[5] [6] thousand cubic meters	NA	NA	60	365	NA
Crushed and broken stone:[6] [7]					
Limestone:					
Agricultural do.	2,119	[e]2,100	1,611	2,600	NA
Other do.	213	[e]200	195	--	NA
Other do.	NA	NA	NA	NA	NA
Sand:[6]					
Industrial do.	NA	NA	1,875	1,700	NA
Other do.	881	NA	1,250	1,100	NA
Sulfur, byproduct	8,000	8,000	6,000	6,000	[e]6,000

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1] Table includes data available through Sept. 1, 1984.

[2] Data represent sales.

[3] Includes shipyard's production of steel castings.

[4] Excludes steel forgings.

[5] Granite and gneiss only; excludes an unreported quantity of other dimension stone.

[6] Estimates by the Geological Survey of Greenland for latest years.

[7] Partial figures; excludes an unreported quantity of quartz and quartzite.

TRADE

Rising North Sea oil production and increased imports of electricity from Sweden and Norway made it possible to import 12% less oil and coal. The United States supplied 1.6 million tons of coal out of total imports of 8.6 million tons, the Republic of South Africa maintained its share at 33%, and Poland increased its share to 15% of the total. The United States also supplied 187,000 tons of petroleum coke valued at $13 million.

Table 2.—Denmark: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	20,601	2,366	--	Finland 1,501; United Kingdom 616.
Metal including alloys:				
Scrap	12,389	11,762	--	West Germany 8,273; Netherlands 1,015.
Unwrought	7,640	8,284	--	Sweden 2,544; Belgium-Luxembourg 2,261.
Semimanufactures	16,378	19,448	37	Sweden 6,235; West Germany 3,837.

See footnotes at end of table.

Table 2.—Denmark: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Copper: Metal including alloys:				
Scrap	13,105	11,905	--	West Germany 10,195.
Unwrought	1,455	1,281	--	Sweden 786; West Germany 388.
Semimanufactures	11,733	6,806	338	West Germany 1,911; France 1,110.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	8,867	14,566	--	West Germany 7,271; United Kingdom 3,854.
Metal:				
Scrap	184,847	117,750	--	West Germany 93,941.
Steel, primary forms	1,024	5,750	--	Belgium-Luxembourg 3,524.
Semimanufactures:				
Bars, rods, angles, shapes, sections	115,100	73,465	34	West Germany 22,544; Sweden 21,209.
Universals, plates, sheets	359,420	290,755	18	West Germany 99,474; Sweden 62,346.
Hoop and strip	24,429	26,917	--	Sweden 18,220; United Kingdom 5,701.
Rails and accessories	2,227	1,558	--	Italy 1,234.
Wire	4,085	3,884	113	Sweden 1,628; United Kingdom 558.
Tubes, pipes, fittings	74,707	72,448	32	Sweden 35,360; West Germany 9,487.
Castings and forgings, rough	23,645	25,461	1	West Germany 9,170; Sweden 8,820.
Lead: Metal including alloys:				
Scrap	1,874	5,993	--	West Germany 3,826; Sweden 1,824.
Unwrought	14,708	9,942	627	Norway 3,950; Austria 1,697.
Magnesium: Metal including alloys, all forms	159	194	--	West Germany 175.
Mercury 76-pound flasks	203	116	--	West Germany 87.
Molybdenum: Metal including alloys, all forms	14	1	--	All to West Germany.
Nickel: Metal including alloys, all forms	57	54	--	United Kingdom 20; West Germany 18.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$2,184	$2,434	--	Sweden $1,544; United Kingdom $763.
Silver:				
Waste and sweepings[2] do	$10,560	$7,347	--	United Kingdom $2,254; France $1,987.
Metal including alloys, unwrought and partly wrought do	$6,239	$7,195	--	United Kingdom $2,930; Sweden $1,501.
Tin: Metal including alloys, all forms	544	735	5	Netherlands 201; Sweden 110.
Titanium: Oxides	574	277	31	West Germany 82; Sweden 60.
Tungsten: Metal including alloys, all forms	17	9	--	All to West Germany.
Zinc:				
Ore and concentrate	615	280	--	Do.
Oxides	39	35	--	Yugoslavia 10; Saudi Arabia 6.
Metal including alloys:				
Scrap	3,772	3,635	--	West Germany 1,960; Norway 1,129.
Unwrought	165	243	--	West Germany 92; Bahrain 41.
Semimanufactures	326	187	--	West Germany 49; Norway 49.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	1,548	1,365	2	Ethiopia 675; Yemen (Sanaa) 179.
Boron: Oxides and acids	261	68	--	Sweden 46; Norway 15.
Cement	374,187	504,225	68,285	Nigeria 172,927; Saudi Arabia 110,197.
Chalk	21,903	27,811	1	Finland 14,807; Sweden 7,329.
Clays, crude	2,261	1,701	6	Sweden 721; Norway 391.
Cryolite and chiolite	18,321	14,415	NA	NA.
Diatomite and other infusorial earth	60,027	64,438	91	West Germany 22,410; Netherlands 10,992.
Fertilizer materials:				
Crude, n.e.s	93	50	--	All to Sweden.
Manufactured:				
Ammonia	439	644	--	Sweden 554.
Nitrogenous	68	53	--	Greece 20; Iceland 19.
Phosphatic	91,192	58,930	--	NA.
Potassic	5,004	6,336	--	Finland 6,305.
Unspecified and mixed	189,412	387,405	--	West Germany 165,492; undetermined 213,561.

See footnotes at end of table.

Table 2.—Denmark: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Gypsum and plaster	956	371	--	West Germany 251; Sweden 30.
Lime	6,688	8,794	--	Norway 7,390; West Germany 534.
Pigments, mineral: Iron oxides and hydroxides, processed	226	295	9	Sweden 139; West Germany 36.
Precious and semiprecious stones other than diamond: Natural value, thousands	$387	$52	--	Switzerland $16; Norway $12.
Salt and brine	121,021	114,533	--	Sweden 80,705; Norway 18,408.
Sodium compounds, n.e.s.: Carbonate, manufactured	--	661	--	United Kingdom 485.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	38,691	57,182	--	West Germany 56,168.
Worked	8,564	7,517	(3)	West Germany 6,878.
Gravel and crushed rock	1,013,000	832,217	--	West Germany 814,748; Sweden 10,254.
Limestone other than dimension	113,012	132,713	--	West Germany 83,420; Sweden 28,069.
Sand other than metal-bearing	129,713	187,992	--	Sweden 155,419; Finland 11,895.
Sulfur:				
Elemental: Crude including native and byproduct	212	80	--	Iceland 50; West Germany 29.
Sulfuric acid	360	387	--	Norway 134; Sweden 128.
Talc, steatite, soapstone, pyrophyllite	163	86	--	Yugoslavia 22; Ecuador 16.
Other:				
Crude	1,359	862	(3)	West Germany 605; Finland 63.
Slag and dross, not metal-bearing	31,084	50,165	--	France 15,575; Norway 12,890.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	190	169	--	Sweden 97; Somalia 28.
Carbon: Carbon black	241	135	--	Iraq 51; Greenland 49.
Coal: Anthracite and bituminous	3,116	1,170	--	Greenland 1,167.
Coke and semicoke	40,565	41,049	--	Norway 19,784; Sweden 17,770.
Peat including briquets and litter	1,876	3,989	--	United Kingdom 2,044; Norway 726.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	85	175	--	Sweden 129; Netherlands 22.
Gasoline do	3,784	3,228	--	Sweden 2,637; Norway 390.
Distillate fuel oil do	4,637	3,525	9	Sweden 2,009; Greenland 287.
Lubricants do	145	215	(3)	Norway 110; Netherlands 24.
Residual fuel oil do	496	1,792	13	United Kingdom 1,187; Portugal 183.
Bitumen and other residues do	621	164	--	Finland 70; Norway 69.

NA Not available.

[1] Includes Faroe Islands. Table prepared by Jozef Plachy.

[2] May include other precious metals.

[3] Less than 1/2 unit.

Table 3.—Denmark: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	5,057	3,522	577	United Kingdom 2,104; West Germany 666.
Metal including alloys:				
Scrap	2,632	2,623	--	West Germany 1,263; Norway 671.
Unwrought	18,566	22,095	7	Norway 11,846; West Germany 3,763.
Semimanufactures	53,533	56,667	469	West Germany 14,269; Norway 8,109.
Chromium:				
Ore and concentrate	346	329	--	West Germany 305.
Oxides and hydroxides	353	253	--	West Germany 184; France 65.
Copper: Metal including alloys:				
Scrap	5,280	4,232	1	United Kingdom 1,227; Sweden 1,073.
Unwrought	2,183	909	--	Sweden 489; United Kingdom 253.
Semimanufactures	26,895	28,491	47	West Germany 8,538; Sweden 6,989.

See footnotes at end of table.

Table 3.—Denmark: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	127,226	183,114	--	Sweden 183,104.
Pyrite, roasted	18,928	15,304	--	Norway 15,277.
Metal:				
Scrap	180,077	87,493	51	United Kingdom 37,012; West Germany 19,394; U.S.S.R. 18,031.
Pig iron, cast iron, related materials	51,467	66,080	2	U.S.S.R. 28,340; Norway 14,506.
Ferroalloys:				
Ferromanganese	3,698	3,091	--	Norway 3,065.
Unspecified	6,998	8,491	--	Norway 6,246; Spain 736.
Steel, primary forms	123,990	81,413	--	Finland 30,513; West Germany 15,881.
Semimanufactures:				
Bars, rods, angles, shapes, sections	285,009	316,097	206	West Germany 83,141; Sweden 76,859.
Universals, plates, sheets	655,980	726,473	49	West Germany 217,469; Sweden 93,745.
Hoop and strip	49,455	56,725	6	West Germany 34,284; Sweden 9,393.
Rails and accessories	17,283	14,670	--	West Germany 7,484; France 5,715.
Wire	29,090	31,806	32	West Germany 11,453; Belgium-Luxembourg 10,235.
Tubes, pipes, fittings	291,220	495,482	75	West Germany 314,356; Italy 51,148.
Castings and forgings, rough	4,482	4,465	(2)	West Germany 1,725; Norway 1,135.
Lead: Metal including alloys:				
Scrap	18,161	7,702	290	Norway 3,967; Nigeria 983.
Unwrought	3,572	7,470	100	West Germany 3,649; Sweden 2,969.
Semimanufactures	3,482	3,794	(2)	West Germany 3,593.
Magnesium: Metal including alloys, all forms	119	243	80	Norway 71; Canada 35.
Manganese:				
Ore and concentrate, metallurgical-grade	611	510	--	Netherlands 225; Belgium-Luxembourg 157.
Oxides	1,616	1,655	2	Belgium-Luxembourg 1,231.
Mercury 76-pound flasks	261	232	29	Sweden 87; United Kingdom 58.
Molybdenum: Metal including alloys, all forms	5	11	(2)	West Germany 9.
Nickel: Metal including alloys:				
Unwrought	116	161	--	Finland 62; Canada 40.
Semimanufactures	137	155	8	West Germany 88; Norway 26.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$6,938	$4,985	$137	Netherlands $2,334; Switzerland $1,137.
Silver: Metal including alloys, unwrought and partly wrought do	$12,814	$10,988	$467	United Kingdom $4,289; West Germany $1,605.
Tin: Metal including alloys:				
Scrap	143	68	--	Norway 16; Portugal 16.
Unwrought	110	264	1	Italy 69; Netherlands 38.
Semimanufactures	42	53	--	West Germany 27; United Kingdom 13.
Titanium: Oxides	6,134	5,643	19	Norway 2,267; West Germany 569.
Tungsten: Metal including alloys, all forms	5	11	(2)	West Germany 5; Sweden 5.
Zinc:				
Oxides	2,334	2,419	--	West Germany 1,651; France 510.
Metal including alloys:				
Scrap	128	73	--	West Germany 31; Cameroon 30.
Unwrought	14,246	12,168	--	Norway 4,918; Finland 4,563.
Semimanufactures	4,913	4,459	--	France 2,217; West Germany 963.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	22,005	5,139	60	Iceland 4,394.
Artificial: Corundum	561	528	(2)	West Germany 502.
Asbestos, crude	5,136	9,701	--	Canada 8,268; Cyprus 1,256.
Barite and witherite	16,951	18,269	--	Netherlands 16,583.
Boron materials:				
Crude natural borates	5,154	4,423	4,421	Turkey 1.
Oxides and acids	388	444	157	Italy 139; France 126.
Cement	32,572	23,954	1	Poland 14,495; West Germany 7,380.
Chalk	15,073	11,181	(2)	West Germany 7,524; France 1,784.
Clays, crude	47,568	48,858	827	United Kingdom 34,216.
Cryolite and chiolite	46,458	46,472	--	Greenland 43,910.

See footnotes at end of table.

Table 3.—Denmark: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Diamond: Gem, not set or strung value, thousands	$2,964	$3,235	--	Belgium-Luxembourg $2,012; Sweden $408.
Diatomite and other infusorial earth	6,236	7,632	1,712	Iceland 3,931; Spain 822.
Feldspar, fluorspar, related materials	12,037	7,211	--	Norway 5,535; Sweden 995.
Fertilizer materials: Manufactured:				
Ammonia	328,162	330,650	12,969	West Germany 136,927; Trinidad and Tobago 54,290.
Nitrogenous	85,108	81,603	907	Norway 26,549; undetermined 34,572.
Phosphatic	11,358	18,818	--	Israel 10,991; West Germany 5,001.
Potassic	245,206	234,414	36,700	West Germany 102,572; East Germany 74,857.
Graphite, natural	853	1,254	55	West Germany 1,118.
Gypsum and plaster	225,014	218,989	--	Spain 158,807; Sweden 48,774.
Lime	7,648	6,285	(2)	West Germany 5,806.
Magnesite	11,130	10,548	166	Austria 4,729; Spain 2,525.
Mica:				
Crude including splittings and waste	173	167	--	United Kingdom 85; Norway 60.
Worked including agglomerated splittings	43	68	--	Belgium-Luxembourg 52.
Nitrates, crude	2,939	1,420	--	Chile 798; Sweden 621.
Phosphates, crude	338,152	260,205	--	Morocco 117,189; Republic of South Africa 69,010; U.S.S.R. 58,252.
Pigments, mineral: Iron oxides and hydroxides, processed	4,457	4,025	12	West Germany 2,864; Spain 643.
Potassium salts, crude	875	1,775	--	All from West Germany.
Precious and semiprecious stones other than diamond: Natural value, thousands	$689	$1,502	$30	Switzerland $1,016; West Germany $301.
Pyrite, unroasted	581	202	--	Sweden 177.
Salt and brine	242,499	313,456	66	West Germany 111,117; U.S.S.R. 57,455.
Sodium compounds, n.e.s.: Carbonate, manufactured	71,898	61,050	--	East Germany 27,137; United Kingdom 8,735.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	103,625	171,125	(2)	Sweden 102,292; Norway 61,254.
Worked	27,053	27,454	--	Portugal 10,482; Sweden 8,655.
Dolomite, chiefly refractory-grade	30,567	28,911	--	Norway 12,679; Sweden 7,598.
Gravel and crushed rock	718,621	710,593	--	Sweden 626,720; Norway 79,222.
Limestone other than dimension	160,510	181,410	--	Sweden 122,097; United Kingdom 55,421.
Quartz and quartzite	16,778	8,235	2	Sweden 7,020; Norway 1,037.
Sand other than metal-bearing	161,755	70,735	37	Belgium-Luxembourg 35,705; Sweden 25,283.
Sulfur:				
Elemental: Crude including native and byproduct	73,069	63,585	--	West Germany 63,082.
Sulfuric acid	14,214	7,326	--	West Germany 5,316; Norway 1,804.
Talc, steatite, soapstone, pyrophyllite	8,963	7,441	(2)	Norway 3,181; Finland 2,471.
Other:				
Crude	49,479	58,049	756	East Germany 39,374.
Slag and dross, not metal-bearing	7,179	6,703	--	United Kingdom 2,402; Norway 1,786.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	15,023	8,678	283	West Germany 5,566; Sweden 2,539.
Carbon: Carbon black	3,995	4,306	157	Sweden 1,763; West Germany 1,353.
Coal:				
Anthracite and bituminous thousand tons	10,886	9,663	76	United Kingdom 2,035; Poland 964.
Briquets of anthracite and bituminous coal	5,511	73	--	United Kingdom 43.
Lignite including briquets	55,474	59,349	--	East Germany 41,691.
Coke and semicoke	78,859	88,376	50	France 27,546; United Kingdom 18,162.
Peat including briquets and litter	21,846	22,227	21	Sweden 11,785; Finland 4,842.
Petroleum:				
Crude thousand 42-gallon barrels	52,441	32,782	--	United Kingdom 14,565; Saudi Arabia 10,280; U.S.S.R. 3,959.
Refinery products:				
Liquefied petroleum gas do	1,727	1,876	(2)	United Kingdom 1,051.

See footnotes at end of table.

Table 3.—Denmark: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Gasoline thousand 42-gallon barrels	7,061	7,149	1	Netherlands 2,902; Sweden 1,319.
Kerosine and jet fuel do	5,748	5,890	(2)	Netherlands 4,101.
Distillate fuel oil do	19,987	21,698	149	Sweden 6,148; Netherlands 3,147.
Lubricants do	2,370	1,214	7	U.S.S.R. 446; Netherlands 203.
Residual fuel oil do	12,416	14,651	138	Sweden 4,528; East Germany 2,432.
Bitumen and other residues do	987	1,205	--	West Germany 475; Netherlands 422.
Petroleum coke do	444	1,238	764	Netherlands Antilles 375.

[1] Includes Faroe Islands. Table prepared by Jozef Plachy.
[2] Less than 1/2 unit.

COMMODITY REVIEW

Metals.—Modernization of process technology in the electric arc steel plant of the Danish Steel Works Ltd. at Frederiksvaerk, Zealand, continued. The company's second arc furnace was converted to an eccentric bottom tap. This was reported to make it possible for the first time in the world to produce slag-free steel and to improve raw material efficiency, because tilting of the furnace was reduced to a few degrees. Employment at the plant was 1,517. Despite the modernization of the now 30% Government-owned steelmaker, the outlook for 1984 remained poor and efforts were made to further reduce production costs.

Nonmetals.—*Cement.*—Aalborg Portland-Cement-Fabrik A/S, a wholly owned subsidiary of the F. L. Smidth Group and Denmark's only cement producer, had a cement capacity of about 2.5 million tons per year. Some years ago, the company converted surplus capacity to the production of special cements. In 1983, one of the company's products was super white portland cement with low alkali content and high sulfate resistance properties, greatly in demand in the Middle East. Although sales of regular cement decreased, exports of special cements were on the rise.

Fertilizer Materials.—Superfos A/S continued production of superphosphate and ammonia-based mixed fertilizers by its subsidiaries, Dansk Ammoniakvaerk A/S and Dansk-Norsk Kvaelstoffabrik A/S. The company's plants were located at Fredericia and Norresundby in central and north Jutland. The Superfos ammonia plant was closed down in the spring, and imported ammonia was used because it was less expensive than the domestic product.

Limestone.—The major producer of calcium carbonate filler and extender products in Denmark was A/S Faxe Kalkbrud, part of the F. L. Smidth Group. Faxe produced chalk whiting and crushed limestone at three locations. The Stevns plant, west Zealand, had a capacity of 200,000 tons per year of chalk whiting for the paper, rubber, plastic, paint, and fiberglass industries. At Faxe Ladeplads, west Zealand, and Grena, northwest Jutland, pulverized limestone was produced, each plant having a capacity of 140,000 tons per year. The limestone products were suitable for use in glass, asphalt, feedstuffs, paint, water softening, fertilizers, and carpets. The Grena plant also produced some pulverized Norwegian dolomite for carpets and paints. Faxe also produced 1 million tons of agricultural limestone and quicklime at Boesdal, Stuberupp, and Vejle. In addition to Faxe, The F. L. Smidth Group had several other limestone interests in Denmark.

Mineral Fuels.—Total energy consumption was 17 million tons of oil equivalent. Domestic oil production was 1.5 million barrels (200,000 tons of oil equivalent) or 1% of the total, coal imports were 8.6 million tons of oil equivalent, and the rest was imported oil.

Natural Gas.—Construction of the Danish natural gas distribution network continued, with startup of the system planned for 1984. The Danish Underground Consortium (DUC) was to supply gas to Government-owned Dansk Olie og Naturgas, which in turn was to distribute the gas to regional cooperative organizations. At startup, a reduced demand of 50 billion cubic feet per year was expected, leaving excess gas of about 30 billion cubic feet for export to Sweden and the Federal Republic of Germany. After startup, the country's oil and gas was to account for 20% to 25% of total energy requirements.

Petroleum.—Danish oil production increased by one-quarter in 1983, with DUC's Dan, Gorm, and Skjöld Fields flowing 43,000 barrels per day into Gorm's offshore loading facilities. Oil was to be landed in 1984 by the Government's pipeline, when gas production was scheduled to start up from the Tyra Gasfield. Gas production was also to result in production of 4,000 barrels per day of condensate to be landed via the Gorm pipeline. Exploratory and appraisal drilling in 1983 was boosted to a record of 14 wells compared with 5 in 1982. DUC was forcing exploratory drilling ahead of the relinquishment of another 25% of its former exclusive concessions on the last day of the year. The remaining 24% was to be relinquished in January 1986. Eight Danish and twenty-four foreign companies have applied for licenses on the relinquished territories.

DUC had notable successes on the East Rosa and Mid Rosa structures, both lying within 15 kilometers of the Gorm platform and therefore readily exploitable. The East Rosa exploratory well tested 9,600 barrels per day of oil with high sulfur gas, and the Mid Rosa-2 well gave test flow of 10,000 barrels per day. Commercial development was under discussion. DUC also tested the West Lulu-1 well, 90 kilometers west of Gorm, where gas was found.

Data on the Dan Field were as follows: Location was in the southwest bloc 200 kilometers west of Esbjerg in water 41 meters deep; estimated recoverable reserves were 72.3 million barrels of 30° API gravity with 0.3% sulfur content; and the startup date was April 1972. Participants in DUC were Dansk Boreselskab (A. P. Moller), operator, 30%; Shell Olie og Gasutvinding Danmark B.V., 40%; Chevron Oil A/S Danmark, 15%; and Texaco A/S, 15%. Production in 1983 was 4,700 barrels per day. Data on the Gorm Field were as follows: Location was 214 kilometers west of Esbjerg in water 38 meters deep; reserves were estimated at 110.7 million barrels of 33° API gravity oil with less than 0.3% sulfur content; and the startup date was May 1981. Participants were the same as for the Dan Field. Production in 1983 was 31,400 barrels per day. Production was into moored tankers together with Dan's production, which came through a 27-kilometer pipeline. In 1984, crude oil was to be sent ashore by pipeline.

In 1983, DUC submitted a plan to the Danish Ministry of Energy to increase oil production from the Dan Field. The plan included 3 new platforms and over 20 wells. The investment was estimated at about $400 million. Extensive studies preceded the planning. Pipelines would connect the new platforms to Tyra and Gorm. An estimated 42 million barrels of new oil was expected in 10 years' time, with 7 million barrels the first year.

GREENLAND

PRODUCTION AND TRADE

Only lead and zinc concentrates and raw cryolite ore were produced and exported.

Exploration Activities.—The Technical University of Lyngby, Denmark, was planning to make a remote sensing survey for minerals in west Greenland. The Technical University of Munich, Federal Republic of Germany, was assessing pyrochlore in alkaline intrusions in south Greenland, and a carbonatite intrusion in the Grönnedal-Ita syenite complex in cooperation with the Geological Survey of Greenland and the Department of Geological Sciences of Durham University, United Kingdom. Several exploration projects sponsored by the European Economic Community were pursued. The Nordisk Mineselskab A/S drilled a tungsten deposit on Ymer Island, east Greenland, and studied apatite at Sarfortoq and Quaqarssuk with the help of the Geological Survey of Greenland and the British Geological Survey. The National Research establishment in Risö, Denmark, made a feasibility study on a low-grade chromium deposit in Narssaq, south Greenland.

Table 4.—Greenland: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[p]
Cryolite, crude ore	NA	NA	44,200	46,400	46,500
Lead, mine output, metal content:					
Of ore hoisted	35,255	34,344	30,000	31,725	24,300
Of concentrates	31,900	30,100	27,400	22,900	[e]28,000
Silver, mine output, metal content:					
Of ore hoisted thousand troy ounces	763	771	720	760	591
Of concentrates do	543	547	543	550	537
Zinc, mine output, metal content:					
Of ore hoisted	92,950	86,832	83,400	85,050	83,025
Of concentrates	86,600	85,700	79,700	77,000	75,477

[e]Estimated. [p]Preliminary. NA Not available.

[1]Table includes data available through Aug. 20, 1984.

[2]In addition to the commodities listed, a variety of crude construction materials (common clays, sand and gravel, and stone) are undoubtedly produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

Table 5.—Greenland: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
Cryolite and chiolite	46,455	43,910	--	All to Denmark.
Lead: Ore and concentrate	24,499	104,144	--	France 75,589; West Germany 17,473; Spain 11,082.
Salt and brine	--	40	--	All to Norway.
Zinc: Ore and concentrate	107,689	354,341	--	France 132,355; West Germany 79,019; Canada 45,000.

[1]Table prepared by Jozef Plachy.

Table 6.—Greenland: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, semimanufactures	51	64	(2)	Denmark 63.
Copper: Metal including alloys, semimanufactures	90	93	--	Denmark 90.
Iron and steel: Metal, semimanufactures	4,909	5,106	1	Denmark 3,999.
Lead: Metal including alloys, all forms	12	17	--	All from Denmark.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$8	$12	--	Do.
Zinc: Metal including alloys, all forms	19	16	--	Do.
NONMETALS				
Cement	9,532	9,400	--	Do.
Clays, crude	22	17	--	Do.
Diamond: Gem, not set or strung value, thousands	$3	$10	--	Do.
Fertilizer materials: Manufactured	787	961	--	Canada 746; Denmark 203.
Gypsum and plaster	--	16	--	All from Denmark.
Lime	1,481	436	--	Do.
Salt and brine	5,208	6,278	--	Denmark 5,015; Spain 1,100.
Sodium compounds, n.e.s.: Carbonate, manufactured	14	13	--	All from Denmark.
Sulfur: Sulfuric acid	19	24	--	Do.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	132	49	--	Do.
Coal: Anthracite and bituminous	2,150	1,167	--	Do.

See footnotes at end of table.

Table 6.—Greenland: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	882	1,369	--	All from Denmark.
Gasoline do	92,047	59,228	--	Sweden 24,497; Norway 16,584.
Kerosine and jet fuel do	51,445	51,747	--	Norway 25,188; Netherlands 22,638.
Distillate fuel oil do	[r]1,136,172	1,123,656	--	Norway 379,394; Denmark 287,218; Sweden 281,347.
Lubricants do	9,884	15,757	([2])	Denmark 15,736.
Bituminous mixtures do	1,691	1,073	--	All from Denmark.

[r] Revised.

[1] Table prepared by Jozef Plachy.

[2] Less than 1/2 unit.

COMMODITY REVIEW

Metals.—Greenex A/S completed its 10th year of operation at its Black Angel Mine in Marmorilik, west-central Greenland. Although lead and zinc concentrate production declined owing to the impoverishment of ores mined, the company achieved its highest sales ever as a result of rising zinc prices and improving dollar exchange rates.

Nonmetals.—Kryolitselskabet Öresund A/S again opened its cryolite open pit at Ivigtuut, southwest Greenland, according to plan, and quarrying of remaining low-grade ore was resumed during the summer.

Mineral Fuels.—The joint Danish-Greenlandic commission concerned with mineral raw materials in Greenland has refused permission to Nordisk Mineselskab and its U.S. partner, Atlantic Richfield Co., to initiate a regular search for oil in Jameson Land in east Greenland in 1984 for lack of insufficient preparation and study. However, in the summer of 1983, the two companies obtained permission to continue some introductory studies of fields in the area in Jameson Land. The more extensive exploration program was estimated to cost up to $100 million over a period of 6 years.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Danish krone (DKr) to U.S. dollars at the rate of DKr9.14=US$1.00, the average for 1983.

The Mineral Industry of Egypt

By John R. Lewis[1]

Crude petroleum continued, by far, to be Egypt's best income producer during 1983, despite the lower prices and sagging demand that were associated with softness in the world's petroleum markets. Phosphate rock, iron and steel, aluminum, and salt were also produced, and although of much less importance than petroleum they were nevertheless important to Egypt's economy. To encourage foreign investment, investors were allowed a majority holding in joint ventures, approval of proposed projects was accelerated somewhat, and Egyptian delegations were out shopping abroad for investments in their country.

One positive result of Egypt's encouragement of industry was an invitation to bid on a 10,000-ton-per-year float glass plant to be built in the new town "Tenth of Ramadan." Technology, equity, and equipment for the venture were sought. Egypt needed domestically made glass because imports were expensive and breakage was high. The country has big deposits of white, glass-grade sand. French, Italian, and U.S. companies submitted bids late in 1983, and an award of contract was expected early in 1984.

Egypt continued to be a significant energy producer in 1983. Petroleum production was on the increase, natural gas projects were encouraged, and while hydroelectric power contributed 8% to the total energy supply, any increase appeared unlikely. Coal, mostly in the Sinai Peninsula, and uranium were also known to exist within the country. Energy consumption was rising rapidly; one major influence on the increase being the very low level of petroleum prices that were set by the Government. Motor fuel, for example, cost only 16% to 20% as much as similar products elsewhere in the world. This heavy consumption was cutting into Egypt's exportable crude oil surplus, thus reducing the income from such exports. The petroleum industry contributed 17% of the country's gross domestic product, 72% of its merchandise exports, and 30% of Government revenues. Official estimates of Egypt's net oil income from 1983 stood at $2.2 billion,[2] down somewhat from an earlier estimate of $2.7 billion. Lower crude oil prices were identified as the cause.

Government Policies and Programs.— On June 15, the U.S. Agency for International Development (AID) awarded a contract to Bendix Field Engineering Co., Grand Junction, Colorado, in connection with a joint Egyptian-American undertaking that will assist the Government of Egypt in providing investment opportunities in mineral and petroleum resources. Management and technical support for the minerals phase of the Minerals, Petroleum and Groundwater Assessments Program (MPGAP) will be provided by Bendix, other contractors will handle support of projects in the petroleum sector. The program was to be carried out by four Egyptian agencies: the Egyptian Geological Survey and Mining Authority (EGSMA), the Desert Research Institute, the Remote Sensing Center, and the Egyptian General Petroleum Corp. (EGPC). AID is the overall sponsor of the program. Among the activities underway or in the planning stages were exploring for disseminated gold in wall rocks of known vein deposits, surface and subsurface reconnaissance, and sampling. Work is also to go forward on gypsum, potash, and salt resources, plus copper and sulfur. Sixty Egyptian professionals were to receive academic training in the United States, while 18 U.S. consultants were to go to Egypt to assist in exploration and to provide training. The aim of MPGAP was to stimulate foreign investment in Egypt's resources. Exploration and development had been made attractive under recently liberalized Egyptian Government policies on mineral concessions and joint venture agreements.

PRODUCTION AND TRADE

Two of Egypt's largest foreign exchange earners continued to be crude petroleum and phosphate rock. By September 1983, for example, production of crude, condensates, and natural gas liquids totaled 820,000 barrels per day, thus creeping ever closer to the Government's goal of 1 million barrels per day output by mid-decade. Crude production had averaged 673,000 barrels per day in 1982. Domestic consumption was running between 400,000 and 450,000 barrels per day, but was increasing rapidly. The balance of crude produced was exported, as were some refined products, and together they produced about 70% of Egypt's export earnings. Phosphate shipments were also substantial, as the entry of Egypt into Far Eastern fertilizer markets promised even greater offshore sales.

Oil export prices, which had been on the decline from 1981 to mid-1983, began an upturn during the second half of the year. Italy took 35% of Egypt's crude oil exports, Israel bought about 26%, and Romania took about 8%. Egypt exported small quantities of petroleum products to Western Europe and as bunker fuel for ships.

Table 1.—Egypt: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum	[r]102,000	120,000	[2]133,812	[r]141,000	[2]140,194
Copper, refined, secondary	2,000	2,000	2,000	[2]2,400	[2]--
Iron and steel:					
Iron ore and concentrate thousand tons	1,435	1,776	[2]1,943	[2]2,140	[2]2,223
Pig iron do	600	[e]650	[e]650	113	[2]196
Steel, crude do	800	800	900	480	[2]125
Semimanufactures do	[e]1,000	847	850	900	[2]378
Ferroalloys: Ferrosilicon[e]	5,000	5,000	5,000	6,000	[2]6,000
NONMETALS					
Asbestos	238	316	325	[2]424	[2]245
Barite	2,136	4,532	[2]2,108	[2]3,101	[2]3,185
Cement: Hydraulic thousand tons	2,957	3,028	[2]3,499	[2]4,260	3,794
Clays:					
Bentonite	3,500	5,200	5,200	5,200	[2]2,512
Fire clay	250,000	942,000	[2]995,000	[2]975,263	[2]205,000
Kaolin	46,544	41,227	[2]32,113	[2]49,787	[2]100,176
Feldspar, crude	3,271	3,309	[2]3,480	[2]8,436	[2]5,945
Fluorspar	682	1,752	535	90	[2]12
Gypsum and anhydrite, crude	796,000	940,000	950,000	[2]931,150	[2]721,340
Lime	88,000	87,000	[2]91,294	94,000	[2]93,660
Nitrogen: N content of ammonia thousand tons	263	400	[2]518	[2]639	[2]905
Phosphate: Phosphate rock do	623	658	[r]720	708	[2]623
Pigments, mineral, natural: Iron oxide	140	126	130	150	[2]0
Salt, marine thousand tons	616	636	679	[2]829	[2]918
Sodium compounds:					
Sodium carbonate	[e]5,000	[r]18,849	23,364	[2]41,273	[2]43,000
Sodium sulfate	2,902	2,942	3,000	3,000	[2]1,950
Stone, sand and gravel:					
Basalt thousand cubic meters	85	96	[2]103	[2]90	NA
Dolomite thousand tons	504	500	500	500	NA
Granite, dimension cubic meters	2,666	6,408	6,400	[2]4,765	NA
Gravel thousand cubic meters	[e]3,300	3,400	3,400	[2]6,480	NA
Limestone and other calcareous n.e.s do	5,845	5,196	[2]5,535	[2]7,037	[2]9,276

See footnotes at end of table.

Table 1.—Egypt: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Stone, sand and gravel —Continued					
Marble blocks (including alabaster) cubic meters	26,000	32,000	[2]46,930	[2]19,380	[2]16,400
Quartz	[e]10,000	10,000	10,000	10,000	NA
Sand including glass sand thousand cubic meters	6,147	6,000	6,200	[2]6,874	[2]166
Sandstone do	787	32	32	[2]785	[2]613
Sulfur:					
Elemental, byproduct	3,206	3,300	[2]2,408	[2]2,281	[2]1,000
Sulfuric acid	3,200	32,000	[2]44,111	[2]45,118	[2]44,899
Talc, steatite, soapstone, pyrophyllite	4,406	4,007	[2]5,723	[2]8,291	[2]4,519
MINERAL FUELS AND RELATED MATERIALS					
Coke: Oven and beehive thousand tons	853	915	920	[2]974	[2]916
Gas, natural:					
Gross production million cubic feet	[e]140,000	84,624	108,000	114,074	120,000
Marketed do	120,000	60,000	70,000	78,000	95,000
Petroleum:					
Crude thousand 42-gallon barrels	180,000	227,395	234,330	[2]245,645	[2]262,486
Refinery products:					
Gasoline and naphtha do	8,840	15,068	16,000	16,200	20,500
Kerosine and jet fuel do	12,710	13,361	13,208	14,100	18,500
Distillate fuel oil do	17,205	18,791	19,000	19,250	25,000
Residual fuel oil do	52,281	47,841	49,004	52,650	70,000
Lubricants do	461	539	600	650	1,000
Liquefied petroleum gas do	1,150	1,612	1,800	1,900	2,000
Asphalt do	1,127	1,654	1,800	1,900	2,200
Unspecified do	--	292	400	450	800
Refinery fuel and losses do	4,242	4,500	4,600	4,650	6,000
Total do	98,016	103,658	106,412	111,750	146,000

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through June 15, 1984.

[2]Reported figure.

Table 2.—Egypt: Exports and reexports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Unwrought	76,466	NA		
Semimanufactures	12,826	NA		
Iron and steel: Metal:				
Steel, primary forms	96	NA		
Semimanufactures:				
Universals, plates, sheets	14,490	NA		
Wire	5	NA		
Tubes, pipes, fittings	1,887	NA		
Castings and forgings, rough	1,500	NA		
Other: Ashes and residues	--	1,984	--	Belgium-Luxembourg 720; West Germany 500; Italy 400.
NONMETALS				
Cement	2,450	NA		
Fertilizer materials: Manufactured:				
Nitrogenous	--	2,324	--	Sudan 2,000; Saudi Arabia 201.
Phosphatic	--	2,275	--	All to Italy.
Unspecified and mixed	--	10	--	All to Saudi Arabia.
Phosphates, crude	55,817	174,320	--	Indonesia 59,990; Albania 38,155; France 31,130; China 24,845.
Pigments, mineral: Iron oxides and hydroxides, processed	--	9	--	All to Saudi Arabia.
Salt and brine	19,500	4,864	--	Rwanda 2,000; Lebanon 1,989; Cyprus 500.

See footnotes at end of table.

Table 2.—Egypt: Exports and reexports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel:				
Dimension stone, crude and partly worked	389	800	--	All to Italy.
Sand other than metal-bearing	--	36	--	All to Greece.
Talc, steatite, soapstone, pyrophyllite	660	493	--	East Germany 460; West Germany 33.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,866	78	--	All to Iraq.
Coke and semicoke	31,885	22,440	--	Romania 22,415; Saudi Arabia 25.
Petroleum:				
Crude thousand 42-gallon barrels	52,041	56,620	3,831	Italy 19,283; Israel 14,834; Romania 4,358.
Refinery products:				
Mineral jelly and wax do.	78	61	--	All to West Germany.
Kerosine and jet fuel do.	4,320	4,838	--	Italy 1,671; France 1,471; Netherlands 756.
Distillate fuel oil do.	1,141	633	--	All to bunkers.
Residual fuel oil do.	5,798	6,526	--	France 1,524; Italy 852; bunkers 4,094.

NA Not available.

[1] Table prepared by Virgina A. Woodson.

Table 3.—Egypt: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Alkaline- and rare-earth metals:				
Unspecified	9	25	--	All from France.
Aluminum:				
Ore and concentrate	1,000	--		
Oxides and hydroxides	652	1,290	6	West Germany 1,053; Netherlands 76; United Kingdom 72.
Metal including alloys:				
Scrap	5	54	--	Austria 43.
Unwrought	491	--		
Semimanufactures	3,447	2,250	50	Italy 581; France 450; West Germany 426; Japan 154.
Chromium: Oxides and hydroxides	64	2	--	East Germany 1; United Kingdom 1.
Cobalt: Oxides and hydroxides	3	6	--	United Kingdom 1; unspecified 5.
Copper:				
Matte and speiss including cement copper	--	939	--	All from Zambia.
Metal including alloys:				
Scrap	--	48	--	Bunkers 43.
Unwrought	2,534	2,116	--	Zambia 1,059; Zaire 905.
Semimanufactures	8,281	9,695	742	United Kingdom 3,996; Greece 840; France 645; Sweden 601.
Iron and steel:				
Iron ore and concentrate including roasted pyrite	5,000	10,000	--	All from Italy.
Metal:				
Scrap	13,804	12,259	1,626	Sudan 6,012; Congo 1,268; Czechoslovakia 1,042; Lebanon 804.
Pig iron, cast iron, related materials	31,075	41,336	--	West Germany 16,232; Republic of Korea 14,948; Switzerland 6,637.
Ferroalloys:				
Ferromanganese	--	4,668	--	Switzerland 4,637; Italy 31.
Unspecified	1,895	2,142	--	West Germany 2,090; Belgium-Luxembourg 6.

See footnotes at end of table.

Table 3.—Egypt: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Steel, primary forms	12,866	16,208	--	West Germany 8,833; Switzerland 5,982.
Semimanufactures:				
Bars, rods, angles, shapes, sections	766,387	868,947	21,681	Czechoslovakia 263,505; West Germany 263,508; East Germany 66,917.
Universals, plates, sheets	138,945	118,911	6,994	West Germany 27,625; Spain 15,806; Italy 10,832; Austria 10,643.
Hoop and strip	5,777	1,808	--	West Germany 891; United Kingdom 402; Lebanon 400.
Rails and accessories	3,628	39,913	25	Poland 35,209; West Germany 1,928; Italy 1,295.
Wire	14,652	12,043	14	West Germany 3,461; Belgium-Luxembourg 3,074; France 1,363.
Tubes, pipes, fittings	78,934	141,168	8,300	France 41,254; West Germany 38,439; Italy 18,356.
Castings and forgings, rough	18,525	30,485	3,311	Italy 8,643; France 7,120; United Kingdom 2,953; West Germany 1,340.
Lead:				
Oxides	4,454	1,910	--	France 522; United Kingdom 318; Bulgaria 262; West Germany 246.
Metal including alloys:				
Scrap	300	1,257	--	Belgium-Luxembourg 1,060; United Kingdom 197.
Unwrought	6,806	10,270	1,130	West Germany 3,661; United Kingdom 2,996; Belgium-Luxembourg 1,301.
Semimanufactures	29	65	--	Turkey 52; Netherlands 4; France 3.
Manganese:				
Ore and concentrate, metallurgical-grade	100	61	--	All from Belgium-Luxembourg.
Oxides	3,909	3,365	143	Belgium-Luxembourg 1,655; Japan 700; Switzerland 485.
Mercury 76-pound flasks	406	1,334	--	United Kingdom 1,160; Spain 87.
Nickel:				
Matte and speiss	13	--		
Metal including alloys:				
Scrap	1	--		
Unwrought	16	4	--	Belgium-Luxembourg 2; Switzerland 2.
Semimanufactures	54	248	--	Belgium-Luxembourg 126; Japan 60; France 24.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$1,062	$344	--	Switzerland $314; West Germany $30.
Tin: Metal including alloys:				
Unwrought	52	160	--	Malaysia 77; Hong Kong 49.
Semimanufactures	5	45	2	Italy 41; Netherlands 2.
Titanium: Oxides	1,995	2,239	195	West Germany 1,104; France 496; United Kingdom 187.
Zinc:				
Oxides	452	369	50	France 141; Italy 102; West Germany 55.
Metal including alloys:				
Scrap	30	5	--	All from Belgium-Luxembourg.
Unwrought	7,515	5,504	--	United Kingdom 2,668; Switzerland 1,500; Zambia 992.
Semimanufactures	715	723	2	West Germany 327; Netherlands 215; Spain 150.
Other:				
Ores and concentrates	250	653	--	United Kingdom 302; West Germany 264; Morocco 33.
Base metals including alloys, all forms	108	167	--	United Kingdom 83; Belgium-Luxembourg 50; West Germany 34.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	825	202	--	Brazil 105; Japan 82; United Kingdom 12.
Grinding and polishing wheels and stones	1,525	--		

See footnotes at end of table.

Table 3.—Egypt: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Asbestos, crude	26,828	2,367	3	Canada 1,724; U.S.S.R. 494.
Barite and witherite	100	252	--	West Germany 152; Turkey 100.
Boron materials: Oxides and acids	102	25	20	France 2; Switzerland 2.
Cement thousand tons	4,229	5,779	34	Greece 3,201; Romania 1,253; Spain 286.
Chalk	31	25	--	All from West Germany.
Clays, crude	16,819	22,700	602	United Kingdom 11,893; Italy 3,774; India 1,743; Czechoslovakia 1,701.
Cryolite and chiolite	--	1,017	--	Italy 991; West Germany 26.
Diatomite and other infusorial earth	434	65	--	West Germany 64.
Feldspar, fluorspar, related materials	8,868	2,157	--	Norway 1,800; Italy 249.
Fertilizer materials:				
Crude, n.e.s	10	3	--	All from West Germany.
Manufactured:				
Ammonia	177	80	--	Belgium-Luxembourg 35; Switzerland 20; United Kingdom 15.
Nitrogenous	531,046	122,634	10,500	U.S.S.R. 74,697; Italy 31,027; France 6,403.
Phosphatic	116,796	62,172	52,072	Belgium-Luxembourg 10,100.
Potassic	24,814	--		
Unspecified and mixed	10,003	11,637	33	U.S.S.R. 9,450; West Germany 1,427.
Graphite, natural	812	479	--	China 305; Italy 100; West Germany 37; United Kingdom 36.
Gypsum and plaster	625	--		
Lime	1,098	90	90	
Magnesium compounds: Magnesite	6,134	5,470	--	North Korea 2,966; United Kingdom 1,028; Austria 1,000.
Mica:				
Crude including splittings and waste	180	205	--	Finland 153; United Kingdom 52.
Worked including agglomerated splittings	15	32	--	Bulgaria 29; Italy 2.
Pigments, mineral: Iron oxides and hydroxides, processed	1,852	4,549	--	China 1,774; West Germany 998; Spain 470; United Kingdom 356.
Pyrite, unroasted	55,155	36,500	--	Italy 20,750; Sweden 15,750.
Salt and brine	172	465	--	United Kingdom 270; Netherlands 120.
Sodium compounds, n.e.s.:				
Carbonate, natural and manufactured	779	13	--	Netherlands 9; West Germany 4.
Sulfate, natural and manufactured	255	31,353	6	Romania 15,033; West Germany 9,504; Italy 6,361.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	42,397	24,147	--	Italy 19,224; Spain 2,219.
Worked	7,047	4,005	580	Italy 3,129; Yugoslavia 49.
Gravel and crushed rock	387	311	--	Italy 200; France 110.
Quartz and quartzite	18	70	--	Belgium-Luxembourg 60; West Germany 10.
Sand other than metal-bearing	2,547	2,294	--	Belgium-Luxembourg 1,829; Spain 275; Italy 108.
Sulfur:				
Elemental:				
Crude including native and byproduct	59,428	56,276	39,997	Switzerland 13,244; France 2,969.
Colloidal, precipitated, sublimed	54	9,001	9,000	NA.
Sulfuric acid	35	67	--	West Germany 33; United Kingdom 18; Japan 12.
Talc, steatite, soapstone, pyrophyllite	526	2,523	--	United Kingdom 1,330; Norway 499; Denmark 270.
Other: Crude	198	161	40	Sudan 100; West Germany 20.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	954	4,176	100	Italy 1,467; West Germany 965; France 792.
Coal: Anthracite and bituminous thousand tons	1,267	1,401	485	U.S.S.R. 624; Australia 248.
Coke and semicoke	6,015	47	--	All from Italy.
Peat including briquets and litter	5,857	11,131	--	Ireland 10,330; West Germany 449.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	1,746	2,143	--	Greece 1,058; Italy 723; Australia 198.
Mineral jelly and wax do.	30	15	--	West Germany 8; China 5.
Kerosine and jet fuel do.	10	147	(2)	NA.

See footnotes at end of table.

Table 3.—Egypt: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products —Continued				
Distillate fuel oil thousand 42-gallon barrels	1,520	3,657	--	Israel 1,181; Italy 1,163; Netherlands 799.
Lubricants do	789	731	18	Italy 349; Greece 146; Turkey 54.
Bitumen and other residues do	85	16	--	All from France.
Bituminous mixtures do	1	16	5	Norway 8; Sweden 1.
Petroleum coke do	88	([2])	--	All from France.
Unspecified do	111	--		

NA Not available.
[1] Table prepared by Virginia A. Woodson.
[2] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—Production at Egypt's only aluminum plant, the Nag Hammadi smelter of the Aluminum Co. of Egypt (Egyptal) continued to be hampered by insufficient electricity, normally supplied by the Aswan High Dam, about 250 kilometers to the south. However, the Ministry of Energy initiated steps during the year that were intended to increase the dam's electric output. The United States, France, and the U.S.S.R. were to collaborate on the project, which was expected to take 5 years to complete.

Charges of alleged dumping of nonalloyed, unwrought aluminum in the markets of the European Economic Communities were terminated after an investigation, with Egyptal's cooperation, revealed that the amount by which the normal value of Egyptal's products exceeded the prices at which the products were sold in the community was minimal and not such as would cause material injury to community producers.

Gold.—The reopening of an assortment of old to ancient gold mines in Egypt's Eastern Desert appeared closer to fulfillment during 1983. EGSMA announced plans for reopening of the Atoud, El-Baramya and El-Sokkari Mines, which had been closed since 1961 because of low prices for gold and high extraction costs. Another group of mines, Okoud and Umm Al-Rouss also in the Eastern Desert, was also under study with the objective of reactivation with assistance from U.S. and British firms.[3]

Iron and Steel.—Construction of the El-Dikheila direct-reduction steelworks moved closer to its scheduled 1986 completion date. The International Bank for Reconstruction and Development (World Bank) and its affiliate, the International Finance Corp. (IFC), did much of the funding of the project, and this placed IFC in a position as a partial owner and partner with the Alexandria National Steel Co., which had been set up as an Egyptian-Japanese joint venture to undertake the project. The plant's ultimate annual steelmaking capacity is variously reported as between 723,000 and 750,000 tons per year. The primary product will be steel reinforcing bars (rebars) for concrete construction within the country.

Construction of an iron ore terminal for El-Dikhelia was to get underway late in 1983. The facility will be located at the nearby Port of Alexandria and will be designed to handle 1.5 million tons of ore per year. Egypt's General Organization for Industrial and Mining Complexes was to supervise construction. A loan of $84 million from the World Bank was to provide financing for the project.

Two firms in Pittsburgh, Pennsylvania, were supplying engineering and equipment for a U.S.-AID-financed $25 million new melting and casting facility being built by the state-owned National Metal Industries S.A. at its present rolling mill site at Cairo. Pennsylvania Engineering Corp. and Rokop Corp. were to receive, upon completion of their turnkey contract, a total payment of $14 million.

Pennsylvania Engineering was to supply two Lectromelt electric arc furnaces with a combined capacity of 35 tons per hour, while Rokop was to furnish a three-strand continuous caster with which to make carbon steel billets of various sizes and lengths. Annual billet output of 158,000 tons was expected. The billets will be rolled into rebars at National Metal's nearby rolling mill for use in local construction. A host of ancillary equipment for the new facility was to be furnished under the contract by the two U.S. corporations. The plant, when completed, will be one of the most modern facilities of its type in the Middle East. Completion was expected by September 1985.

Ferrosilicon.—There was only one ferrosilicon producer in Egypt in 1983, and the country was importing almost one-half of its total requirements. The Egyptian Chemical Co. produced 6,000 tons per year of ferrosilicon against a domestic demand for 10,000 tons per year.

Egypt expected to be an exporter of ferrosilicon by 1985, probably to the United States, Japan, and especially to Middle Eastern countries, where a surge in steel production appeared likely. This was to be accomplished through the completion of a new plant at Idfu, in the Nile River Valley, about 100 kilometers north of the Aswan hydroelectric dam. The state-owned Egyptian Ferro-Alloys Co. (Efaco) began planning and construction, with foreign assistance, during 1975. The project was nearing completion in 1983. The architecturally and environmentally harmonious plant was sited on the Nile on a 50-acre tract that was chosen because high-grade quartzite was located nearby, steel turnings and mill scale were economically available, coke from the El Nasr coking plants was available via barge from the Helwan steelworks, and there was relatively low-cost electricity, skilled labor, raw materials, and reasonably priced transport. Electrode paste will be the only part of the process that is not produced within Egypt.

The plant will have four 14,000-ton furnaces, one of which was to be started up in 1984; the remainder by late 1985. The four 21.5-megavolt-ampere furnaces were to be housed in a large metal structure. Seventy-five percent ferrosilicon will be the primary product. When the new Efaco plant is in operation, Egypt's Helwan steelworks and three minimills will be, for the first time, self-sufficient in domestic raw materials.

Although designed to produce bulk ferroalloys only, oversupplies of ferrosilicon would probably prompt some production of ferromanganese and calcium carbide for use by the Egyptian steel industry.

NONMETALS

Cement.—Construction of new facilities and the addition of production lines to several existing plants during 1983 brought Egypt's cement production capacity to 7.5 million tons per year, 1.1 million tons more than had been anticipated 1 year earlier. Even with these increases, roughly one-half of Egypt's need for cement was filled by imports. If planned expansion projects are all carried to completion, production by the end of the decade will have about quadrupled, and Egypt will have ample cement available for export.

The 1.5-million-ton-per-year Russian-built wet kiln at Helwan Portland Cement Co.'s Assiut plant was being converted to a dry process with a preheater and precalciner. Work was expected to be completed by late 1984. Consultant on this and a number of other cement plant expansion projects of the Egyptian Government's Ministry of Housing and Reconstruction was the Arab Swiss Engineering Co.

Table 4.—Egypt: Cement production facilities, by company

(Capacity in thousand tons)

Company	Location	Startup date	Current annual capacity	Planned annual capacity
Alexandria Portland Cement Co	Al-Maks (Alexandria).	1948	680	1,000
	Ameriyah	1985	--	2,400
Helwan Portland Cement Co	Helwan	1930	1,500	5,000
	Assiut	1960	1,500	4,200
National Cement Co	El-Tabbin	1984	--	3,500
	Nag Hammadi	1983	--	1,000
	Beni Suef	1984	--	1,000
Suez Cement Co	Suez	1983	1,000	2,200
	Quattamia	1984	1,400	2,600
Tourah Cement Co	Tourah	1929	1,400	3,800

Phosphate Rock.—Phosphate rock, from a number of mines strung across central Egypt, continued to be a major foreign exchange earner. Exports in 1982 were about as much as those in 1981. Egyptian fertilizer was produced in compliance with strict world specifications and was increasingly finding its way into Far Eastern markets.

In mid-1983, Seltrust Engineering Ltd. of London announced that it had been engaged as purchasing agent for the Abou Zaabal Fertilizer & Chemical Co. of Cairo. Seltrust was to issue calls in October and November for bids for engineering and the supply of equipment and associated structures for expanding the mining operation at Abou Zaabal's West Sebaeya Mine, 31 kilometers north of Idfu on the Nile River. Before expansion was begun output was 600,000 tons per year. The project was designed to increase production to 4.3 million tons of ore per year. Output was to supply a new triple phosphate and phosphoric acid plant at Abou Zaabal, about 600 kilometers to the north.

Calls for bids were to be made for mining equipment, the beneficiation plant, workshops, servicing facilities, infrastructure buildings, and automotive equipment. The beneficiation plant will be capable of handling 4,000 tons of phosphate rock per day.

MINERAL FUELS

Coal.—Egypt's Electric Authority announced early in 1983 that large reserves of volatile, low-cost subbituminous coal in the northern Sinai Peninsula were to be used to fuel Egypt's first new coal-fired electric power station to be built in many decades. The Government of Japan agreed to grant the 'Ministry of Power $1.1 million for feasibility and technical studies for the new powerplant at Ein Mossa. Studies and a report were to be completed by yearend, and then the project was to be presented to a number of international financing organizations.

Natural Gas.—The Government continued to promote the development of gas transportation systems and increased domestic uses for a large percentage of the natural gas associated with the increasing output of crude oil. During the year, a major new system, the Gulf of Suez Gas Gathering Project, was officially commissioned. The system involved a network of gathering lines from wells in the prolific Gulf of Suez offshore oilfields that fed into the Suez Gas Terminal and Compression Station's processing plant at Ras Shukair. The plant's capacity was 80 million cubic feet of gas per day, from which up to 3,000 barrels per day of condensate and about 3,300 barrels per day of liquefied petroleum gas (LPG) were to be extracted. From this point, a 16-inch trunk pipeline runs to the city of Suez at the northern end of the Gulf. Gas from the plant will be used in and around Suez in a fertilizer plant, an electric-generating station, and a cement plant. Gas will also be made available, probably on an intermittent basis, to a second powerplant at Ismailia. Eventually, this entire project is expected to become part of a national gas pipeline network. Most of Egypt's natural gas is recovered and all is used domestically. None is exported.

Design work was underway on another gas-processing plant, to be located at Abu Qir Bay, 5 miles east of Alexandria on Egypt's Mediterranean coast. Egypt's Western Desert Petroleum Co. (Wepco) let a $24.6 million contract during the summer of 1983 to Chapman Engineers Inc. of Houston, Texas, for engineering and construction of the plant. Wepco was a joint venture of EGPC and Phillips Petroleum Co. Chapman will design and direct the construction as prime contractor in a consortium with Japan Steel Works and the Mitsubishi Co. of Japan. The contractors are to train personnel in the operation and maintenance of the plant when it is completed.

Gas for the plant will come from fields off Egypt's Mediterranean coast. The two-stream arrangement will produce an LPG mix that is 30% propane and 70% butane, and it will mainly be used by residential customers. A powerplant under construction on the Suez Canal will be supplied with condensate from the Abu Qir Bay plant. The plant will operate at a rate of 15,400 barrels per day of LPG and 400 to 500 barrels per day of condensate.

Petroleum.—*Exploration.*— Exploration for petroleum in Egypt has gone through five separate phases, beginning in the mid-19th century. Over 100 agreements with more than 40 oil companies were concluded during the fifth phase beginning in 1973, and exploratory footage drilled in the subsequent 10-year period was more than double that drilled throughout the four previous exploration phases combined. In 1982 alone, 90 wildcats were drilled in Egypt totaling more than 800,000 feet. More than 25 oil and gas discoveries were logged in the period, mostly in the Gulf of Suez, where 20 companies from many nations were operating in 1983. Exploration was still very active in the gulf as well as elsewhere in Egypt in 1983, and operators were beginning to look at mostly the unexplored North Sinai area with considerable interest.

One important Gulf of Suez prospect continued to be the Ras Budran Field in the northern reaches of the gulf, close to the Sinai shore. The first two wells drilled by the Suez Oil Co. (SUCO) yielded production of 15,000 barrels per day. Nine more wells were to be drilled by yearend and tied into a gathering system. Production from the total of 11 wells was expected to be about 60,000 barrels per day.

Offshore in the Mediterranean Sea, International Egyptian Oil, was drilling its Alexia No. 2 well in offshore Block No. 3, northeast of Malta. The drilling rig was a semisubmersible, the Scarabeo Quattro, owned by Saipem S.p.A. The well was in 373 feet of water; total depth objective was 19,680 feet and the cost was estimated at $25 million. Two other wells in the block, Alexia No. 1 and Alexia No. 1-A, had run into trouble and most likely were not completed.

Egypt's Western Desert has never lived up to Egyptian expectations. Operators and the Government hoped that the western edge of the desert would contain an extension of the prolific Sirte Basin in adjacent Libya, but only small fields have been found. Nevertheless, the search was active in 1983.

Based upon the experience that had been gained by oil companies operating in the region, the feeling was that the area contains small fault blocks, which could result in a string of small oilfields that would all be able to use the Abu Gharadig facilities of the Amoco International Oil Co. These include a gas pipeline to Cairo and an oil line to the Mediterranean Sea via Alamein.

Production.—Egypt's crude oil production for 1983 averaged 719,140 barrels per day, an increase of 46,140 barrels per day above that of 1982. Domestic refineries took about 400,000 barrels daily for local use and the remaining 319,000 barrels per day was exported, mostly to one buyer, Standard Oil Co. (Indiana).[4] During the final 4 months of the year, EGPC invoked a crude sale price freeze that stabilized Egypt's prices, which had fluctuated rather actively during the year and were causing some confusion and concern among Middle East producers and buyers. In May, crude reserves were 3.3 billion barrels of crude oil and 7.2 trillion cubic feet of natural gas. Egypt's largest producer continued to be the Gulf of Suez Petroleum Co. (Gupco), owned by EGPC and Amoco International (United States), which produced 517,600 barrels per day. El Morgan Field in the Gulf of Suez was the largest oilfield that Standard Oil of Indiana, parent of Amoco, operated anywhere in the world.

The Gulf of Suez was Egypt's most prolific producing area. Of the 719,140 barrels produced daily in the country, 527,680 barrels came from the gulf area, 145,100 barrels came from the neighboring Sinai Peninsula, 26,480 barrels came from the Eastern Desert, and 19,880 barrels were produced daily in the Western Desert.

Across the gulf, on the Sinai side, development by SUCO of a somewhat unique offshore associated gas reinjection and gas-lift operation was well along. It was begun in 1979. At the Ras Budran offshore field, three wellhead platforms sited 5 to 6 kilometers from shore were installed in 134 feet of water over previously drilled production wells. Two platforms had space for nine wells each, while the third platform had room for four wells. The operators planned for 16 production wells and 6 gas injection wells. Oil, water, and associated low-pressure gas produced by these wells was to be transported ashore through 12- and 20-inch submarine pipelines. The gas was to be separated and compressed at an onshore plant and returned via an 8-inch pipeline to the platforms for use in gas lift operations. Crude was to undergo water and gas removal and was then to be placed in tanks providing storage for about 30 to 40 days' production. Oil, when destined for foreign buyers, was to move seaward through a seabed pipeline to a floating terminal moored in 118 feet of water, which would enable tankers to moor and load.

Meanwhile, production at Egypt's oldest offshore field, Belayim, in the Gulf of Suez, close to the eastern shore, continued to grow. In October 1973, production was down to 64,000 barrels per day from a 1967 peak of 94,000 barrels per day. The Belayim Petroleum Co. (Petrobel) let a contract in the fall of 1983 for installation of four new offshore production platforms and expansion of several existing platforms. Petrobel is the operating company for a joint venture of EGPC and International Egyptian Oil, a subsidiary of Italy's Azienda Generali Italiana Petroli S.p.A. Production during 1983 was 120,000 to 140,000 barrels per day, and the improvements were expected to bring production into the 160,000- to 200,000-barrel-per-day range, a decided improvement in a field thought to be in its depleted cycle 10 years earlier.

Egypt's Western Desert, while only a minor contributor to the country's overall oil production, witnessed exploratory and development drilling during the year. The Meleiha Field, located north of the Qattara Depression and west of Alamein, was to be put on production during the summer. Additional wells were planned by the joint operating company whose major interest holder was EGPC.

Early in 1983, the Egyptian Ministry of Petroleum expressed, to the International Energy Agency (IEA) of the Organization for Economic Cooperation and Development, its interest in participating in the Implementing Agreement for the program of research, development, and demonstration on enhanced recovery of oil. Egypt's Ministry of Petroleum described experimental work that they were carrying out in the injection of steam and flue gas-derived carbon dioxide into oil reservoirs. Enhanced recovery of oil can sometimes flush enough additional oil from a reserve so that ultimate recovery of oil can be about 90% of the oil in place. The governing board of the IEA approved the participation of Egypt in the programs as well as its participation in the implementing agreement in late 1983.

Petrochemicals.—Construction and engineering work was progressing on Egypt's first petrochemical complex at Alexandria. Work on an 80,000-ton-per-year polyvinyl chloride unit was on schedule. In addition, during 1983 a contract was let for the engineering work for a 100,000-ton-per-year vinyl chloride plant, a 60,000-ton-per-year chlorine plant, and caustic soda units. The contractor was Tokyo Engineering Co. of Japan. Even more petrochemical units were under study, including a 200,000-ton-per-year ethylene unit, a 100,000-ton-per-year light-duty polyethylene unit and a 40,000-ton-per-year light-duty polyethylene unit, and a 40,000-ton-per-year heavy-duty polyethylene plant.

Meanwhile, El Nasr Petroleum Co. had hired Snam Progetti S.p.A. of Italy to build a $75 million, 40,000-ton-per-year alkylbenzene unit at its Ameriya plant near Alexandria. Completion was scheduled for 1984.

Uranium.—The future of fuel for eight planned nuclear power reactors appeared more firm when, late in 1983, an agreement was drawn up between Egypt and Niger in which Niger was to supply uranium for the projects. During the year, the Government of Niger decided to cease its sale of uranium ores and concentrates to Libya. It was assumed that these materials would be shipped to Egypt in the future. Egypt was also seeking the aid of French nuclear experts to do some further studies on the feasibility of extracting uranium materials from the Eastern Desert. Late in 1983, an agreement in principle for scientific and technical cooperation had been reached between the Egyptian Government and the Commissariat a l'Energie Atomique, of France.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, value have been converted from Egyptian pounds (£E) to U.S. dollars at the rate of £E0.70=US$1.00.

[3] Mining Magazine (London). V. 150, No. 3, Aug. 1983, p. 78.

[4] Middle East Economic Survey (Nicosia, Cyprus). Oil and Gas Output Rises to 38.3 mn tons in 1983. V. 27, No. 23, Mar. 19, 1984, p. A-7.

The Mineral Industry of Finland

By Joseph B. Huvos[1]

Following the 1982 recession, the Finnish mining industry gradually recovered during 1983. The upswing of the U.S. economy and the upward trend in world market prices of many important metals, such as nickel and zinc, stimulated the industry. The intensive investment activity of the past few years resulted in plants operating at almost full capacity, and new metal production records were being achieved. The short-term outlook for the minerals industry was regarded as good, but unless new useful mineral deposits were found, only two mines were expected to remain in operation by the end of the century; all other mines are expected to be depleted.

In 1983, mining and quarrying at production cost accounted for about $170 million,[2] or 0.35% of the gross domestic product of about $49 billion. Total ore hoisted by all Finnish mines was 9 million tons. Inflation was down somewhat to 9%, still higher than the 7.5% average for European countries. Unemployment was 6.5%.

At the international level, Finland continued to be a modest producer of minerals including vanadium, cobalt, copper, nickel, zinc, chromite, apatite, ilmenite, talc, and wollastonite.

Important events in Finland's mineral industry included commissioning of a cobalt salt plant at Kokkola and the Kostamush (Kostamus) iron ore project in the U.S.S.R.; construction continued on Government-owned Outokumpu Oy's Tornio ferrochrome plant, the Enonkoski nickel mine, and the Pyhäsalmi pyrite mine. Plans were approved for a new sulfuric acid plant at Harjavalta and extension of the natural gas pipeline from the U.S.S.R. A molybdenum deposit was discovered and a pilot plant for producing barite was started. Closed were Outokumpu's Virtasalmi and Myllikoski Oy's Luikonlahti copper mines.

New foreign ventures included Outokumpu's purchase of A/S Sydvaranger's Bidjövagge copper mine in Norway and other joint ventures undertaken to expand availability of raw materials for Finland in Tanzania, Turkey, the Philippines, Canada, and other countries.

PRODUCTION AND TRADE

In 1983, Outokumpu purchased majority interest in the Nipert Co. of Delaware, Ohio. This purchase was to strengthen Outokumpu's position in the U.S. copper market. The company is to work closely with Outokumpu Metals (USA) Inc. of Detroit, Michigan. Mineral trade with the United States consisted of Finnish exports of nonferrous metals, iron and steel products, and chromium ore and imports of copper ore, lead ore, boron compounds, fertilizer, coal, and petroleum coke.

Table 1.—Finland: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983^{p}
METALS					
Aluminum metal, secondary	8,000	8,000	9,000	9,200	^{e}9,200
Cadmium metal, refined	590	581	621	566	616
Chromium: Chromite:					
Gross weight:					
Lump ore	257,107	175,770	209,912	159,858	184,941
Concentrate	152,297	165,000	181,000	160,234	141,785
Foundry sand	25,289	21,400	21,400	24,926	18,690
Total	434,693	362,170	412,312	345,018	345,416
Cr_2O_3 content:					
Lump ore	69,419	NA	53,318	45,879	42,536
Concentrate	66,880	NA	72,207	64,254	58,132
Foundry sand	11,100	NA	10,073	11,566	8,816
Cobalt:					
Mine output, metal content	1,065	1,035	1,034	930	^{e}900
Metal, refined	1,162	1,151	1,229	1,455	1,550
Copper:					
Mine output, metal content	41,065	36,918	38,539	34,836	25,206
Metal:					
Smelter:					
Primary	55,300	49,200	54,747	66,333	74,455
Secondary	9,900	10,000	12,950	19,051	12,597
Total	65,200	59,200	67,697	85,384	87,052
Refined:					
Primary	33,027	30,542	23,796	37,969	45,376
Secondary^{e}	10,000	10,000	10,000	10,000	10,000
Total	43,027	40,542	33,796	47,969	55,376
Gold metal troy ounces	28,325	41,828	31,893	36,780	25,206
Iron and steel:					
Iron ore, marketable, all types:					
Gross weight thousand tons	1,144	1,172	1,230	1,082	1,100
Fe content do.	738	755	789	703	715
Metal:					
Pig iron do.	2,038	2,019	1,978	1,957	1,898
Ferroalloys: Ferrochromium do.	49	53	52	55	59
Steel, crude:					
Ingots do.	2,469	2,472	2,393	2,391	2,416
Castings do.	30	37	35	23	--
Semimanufactures, rolled do.	1,900	2,509	1,848	1,848	1,964
Lead:					
Mine output, metal content	1,000	1,134	1,942	1,883	2,125
Refined, secondary	3,000	3,200	4,500	4,400	^{e}4,000
Mercury 76-pound flasks	1,348	2,170	1,949	2,085	1,871
Molybdenum metal	104	114	165	216	^{e}200
Nickel:					
Mine output, metal content	5,800	6,531	6,864	6,216	4,915
Metal, electrolytic	11,460	12,807	13,310	12,615	14,837
Platinum-group metals:					
Palladium troy ounces	932	675	1,993	4,662	2,283
Platinum do.	711	225	1,608	4,147	2,186
Selenium metal kilograms	17,541	17,250	9,122	10,020	11,172
Silver metal troy ounces	1,027,729	1,429,581	1,215,457	1,188,399	979,868
Titanium concentrate: Ilmenite:					
Gross weight	119,700	159,000	161,500	167,800	163,900
Ti content	54,223	72,026	72,998	75,846	74,083
Vanadium (V_2O_5):					
Gross weight	4,941	5,076	5,557	5,619	5,694
V content	2,768	2,844	3,112	3,100	3,141
Zinc:					
Mine output, metal content	51,623	58,433	53,480	54,568	55,913
Metal	^{r}169,854	^{r}167,400	180,900	125,000	155,336
NONMETALS					
Cement, hydraulic thousand tons	1,749	1,793	1,794	1,794	1,826
Feldspar	67,928	74,089	63,066	69,600	52,066
Lime	^{e}439,105	392,227	382,903	263,033	231,000
Mineral wool	103,639	140,900	140,900	140,500	^{e}100,000
Nitrogen: N content of ammonia	114,200	70,100	68,800	64,800	67,700
Phosphates, natural: Apatite thousand tons	3	138	201	233	381
Pyrite, gross weight	341,967	321,797	403,352	385,000	448,848
Sodium compounds: Sodium sulfate^{e}	45,000	45,000	45,000	45,000	45,000

See footnotes at end of table.

Table 1.—Finland: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983[p]
NONMETALS —Continued					
Stone:					
Limestone and dolomite:					
For cement manufacture thousand tons	2,339	2,534	2,534	2,446	4,237
For lime manufacture do.	439	392	383	382	NA
For sulfite and metallurgical use do.	80	82	82	82	NA
Other do.	1,241	1,428	631	1,040	NA
Quartz do.	217	237	255	249	213
Sulfur:					
S content of pyrite do.	151	144	184	177	224
Byproduct:					
Of metallurgy do.	263	247	234	270	265
Of petroleum do.	30	30	[e]30	10	[e]10
Total do.	444	421	448	457	499
Sulfuric acid do.	1,048	1,039	1,095	1,222	[e]1,200
Talc	267,180	317,901	307,915	325,000	318,430
Wollastonite	10,576	8,782	13,690	15,000	15,400
MINERAL FUELS AND RELATED MATERIALS					
Peat:					
For fuel use thousand tons	1,551	1,841	1,303	5,500	3,355
For agriculture and other uses do.	773	578	204	88	274
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	17,508	16,449	17,434	16,890	20,238
Jet fuel do.	1,806	1,944	1,984	1,720	2,519
Kerosine do.	40	2,000	2,046	1,829	2,658
Distillate fuel oil do.	28,000	5,505	3,827	2,865	29,534
Residual fuel oil do.	24,997	28,372	21,672	16,004	15,012
Liquefied petroleum gas do.	1,188	1,334	1,659	1,438	1,694
Other do.	8,477	19,876	17,381	29,254	3,668
Refinery fuel and losses do.	5,035	--	--	--	3,465
Total do.	87,051	75,480	66,003	70,000	78,788

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1] Table includes data available through July 27, 1984.

Table 2.—Finland: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Scrap	255	62	--	Norway 41; West Germany 20.
Unwrought	4,643	6,305	125	Japan 1,992; Sweden 1,389.
Semimanufactures	22,758	19,055	25	United Kingdom 3,525; West Germany 3,287; Sweden 3,020.
Arsenic: Oxides and acids	--	4	--	All to Sweden.
Cadmium: Metal including alloys, all forms	554	658	95	United Kingdom 184; Sweden 105.
Chromium: Ore and concentrate	250,898	199,806	--	Sweden 162,312; France 17,530.
Cobalt: Metal including alloys, all forms	1,564	1,297	391	West Germany 195; East Germany 165; Japan 158.
Copper:				
Ore and concentrate	--	12,175	--	Sweden 5,077; U.S.S.R. 3,861.
Matte and speiss including cement copper	33	79	--	Sweden 58; Norway 21.
Oxides and hydroxides	580	292	--	United Kingdom 108; France 83.
Ash and residue containing copper	5	61	--	Sweden 56.
Metal including alloys:				
Scrap	242	197	--	Denmark 159; India 37.
Unwrought	22,749	19,402	70	Belgium-Luxembourg 7,519; East Germany 3,733; Sweden 2,498.
Semimanufactures	27,207	30,603	1,574	United Kingdom 6,698; Sweden 3,850; West Germany 2,834.

See footnotes at end of table.

Table 2.—Finland: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Gold:				
Waste and sweepings value, thousands	$1,017	$429	--	Sweden $191; United Kingdom $183.
Metal including alloys, unwrought and partly wrought troy ounces	18,294	13,471	--	West Germany 7,523; United Kingdom 5,530.
Iron and steel: Metal:				
Scrap	206	126	--	Netherlands 113.
Pig iron, cast iron, related materials	274	121	NA	United Kingdom 53; Norway 52.
Ferroalloys:				
Ferrochromium	25,459	22,705	--	United Kingdom 8,655; Sweden 8,169.
Ferrosilicomanganese	1	2	--	All to Sweden.
Steel, primary forms	206,169	140,441	--	Saudi Arabia 50,100; Sweden 48,435.
Semimanufactures:				
Bars, rods, angles, shapes, sections	149,426	121,168	2,359	Sweden 21,162; West Germany 18,159.
Universals, plates, sheets	474,027	483,007	62,070	West Germany 127,764; Denmark 71,947.
Hoop and strip	20,579	27,277	1,892	U.S.S.R. 5,220; West Germany 5,024.
Rails and accessories	44	70	19	U.S.S.R. 22; Norway 11.
Wire	2,404	4,046	--	Sweden 1,977; U.S.S.R. 1,589.
Tubes, pipes, fittings	72,600	81,593	1	Sweden 27,870; U.S.S.R. 16,401.
Castings and forgings, rough	3,418	1,894	--	Sweden 1,572; Libya 148.
Lead:				
Ore and concentrate	3,135	17	17	
Oxides	--	23	--	All to West Germany.
Metal including alloys:				
Scrap	321	86	--	Denmark 60; Sweden 26.
Unwrought	853	1,088	--	Sweden 571; Belgium-Luxembourg 458.
Semimanufactures	104	27	--	Sweden 22.
Magnesium: Metal including alloys, scrap	33	22	--	Sweden 14; Brazil 7.
Mercury 76-pound flasks	1,508	1,799	--	Belgium-Luxembourg 1,392.
Molybdenum:				
Ore and concentrate	340	425	--	All to East Germany.
Metal including alloys, all forms	--	5	--	Mainly to Sweden.
Nickel:				
Matte and speiss	2,691	2,051	--	All to Norway.
Metal including alloys:				
Scrap	--	392	--	Norway 258; Sweden 133.
Unwrought	11,135	11,807	3,085	Norway 2,114; United Kingdom 1,330.
Semimanufactures	8	7	--	Sweden 3; United Kingdom 3.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	1,350	836	--	Sweden 322; United Kingdom 289.
Silver:				
Waste and sweepings[2] value, thousands	$8,371	$4,744	$1,202	United Kingdom $1,829; Sweden $1,385.
Metal including alloys, unwrought and partly wrought thousand troy ounces	1,800	2,733	225	United Kingdom 1,897; West Germany 547.
Tin: Metal including alloys, all forms	51	37	1	Sweden 24; United Kingdom 7.
Titanium: Oxides value, thousands	$3,363	$3,639	NA	NA.
Tungsten: Metal including alloys, all forms	11	10	--	Belgium-Luxembourg 7; West Germany 3.
Vanadium:				
Ore and concentrate	--	40	--	All to Spain.
Oxides and other compounds value, thousands	$25,468	$18,252	$428	West Germany $5,545; United Kingdom $3,191; France $2,973.
Zinc:				
Ash and residue containing zinc	1,315	798	--	Belgium-Luxembourg 318.
Metal including alloys:				
Scrap	2,427	1,498	--	Norway 788; United Kingdom 326.
Unwrought	116,069	118,809	19,274	United Kingdom 27,823; Netherlands 17,673; Sweden 14,614.
Semimanufactures	113	32	1	United Kingdom 21.
Other:				
Ores and concentrates of precious metals value, thousands	$465	$2,437	--	All to United Kingdom.
Ashes and residues	117	519	5	Sweden 296; Belgium-Luxembourg 104.
Base metals including alloys, all forms	33	15	NA	Belgium-Luxembourg 4; Sweden 2.

See footnotes at end of table.

Table 2.—Finland: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	129	135	([3])	U.S.S.R. 94; Tanzania 17.
Cement	69,685	81,886	--	U.S.S.R. 59,040; Sweden 21,464.
Chalk	234	276	--	U.S.S.R. 275.
Clays, crude	1,998	1,037	--	U.S.S.R. 375; Norway 354.
Diamond:				
Gem, not set or strung value, thousands	$381	$165	--	Belgium-Luxembourg $90; Sweden $72.
Industrial:				
Natural do.	--	$30	--	All to Sweden.
Synthetic do.	$1,080	$934	$911	Sweden $23.
Feldspar, fluorspar, related materials	47,821	42,041	--	United Kingdom 28,249.
Fertilizer materials:				
Crude, n.e.s	320	119	--	United Arab Emirates 60.
Manufactured:				
Nitrogenous	31,145	25,975	--	Zimbabwe 11,968; United Kingdom 4,525.
Phosphatic	796	--		
Potassic	13,624	17,092	--	All to Japan.
Unspecified and mixed	50,730	235,798	671	U.S.S.R. 150,786; China 66,939.
Lime	933	758	--	Sweden 451; U.S.S.R. 178.
Magnesium compounds	137	954	--	Sweden 506; Norway 283; U.S.S.R. 165.
Mica: All forms	([3])	132	--	Mainly to Japan.
Phosphates, crude	131	28	NA	NA.
Pigments, mineral: Iron oxides and hydroxides, processed	2	46	--	All to Iraq.
Precious and semiprecious stones other than diamond: Natural kilograms	432	384	--	West Germany 378.
Pyrite, unroasted	69,538	69,387	--	Italy 44,610; Netherlands 14,964.
Salt and brine	242	332	--	Japan 248; Denmark 53.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	--	218	--	All to Sweden.
Sulfate, manufactured	3,969	3,762	--	Sweden 3,626.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	432,554	565,264	237	Netherlands 359,277; Italy 124,527.
Worked	2,454	1,979	4	Sweden 976; U.S.S.R. 262.
Dolomite, chiefly refractory-grade	--	20	--	All to U.S.S.R.
Gravel and crushed rock	113,910	236,807	1	Netherlands 193,395; Sweden 33,457.
Limestone other than dimension	12,442	12,288	--	Sweden 11,022; Denmark 1,256.
Quartz and quartzite	6,253	2,217	--	United Kingdom 541; Sweden 493.
Sand other than metal-bearing	20,595	3,751	--	Sweden 2,887; U.S.S.R. 572.
Talc, steatite, soapstone, pyrophyllite	60,314	53,099	--	Sweden 12,496; West Germany 8,266.
Other:				
Crude	11,138	11,914	6	West Germany 5,601; Italy 1,571.
Slag and dross, not metal-bearing	6,756	1,138	--	Sweden 1,054.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	594	1,361	--	U.S.S.R. 872; Sweden 450.
Carbon: Carbon black	9,745	1,204	--	Ireland 1,201.
Coal: Briquets of anthracite and bituminous coal	3	9	--	All to Denmark.
Coke and semicoke	7,537	2,552	--	Norway 2,460.
Peat including briquets and litter	74,145	91,393	--	Sweden 66,257; Netherlands 11,926.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	1	1	--	Mainly to U.S.S.R.
Gasoline do.	6,408	5,675	--	Sweden 2,406; Netherlands 1,300.
Distillate fuel oil do.	5,482	5,691	--	Denmark 1,918; West Germany 1,814.
Lubricants do.	96	250	--	U.S.S.R. 244.
Residual fuel oil do.	2,155	2,033	--	United Kingdom 834; Sweden 548.
Bitumen and other residues do.	78	145	([3])	Sweden 142.
Bituminous mixtures do.	20	32	--	U.S.S.R. 31.

NA Not available.

[1] Table prepared by W. L. Zajac.

[2] May include platinum-group metals.

[3] Less than 1/2 unit.

Table 3.—Finland: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	3,925	5,588	--	West Germany 2,533; Denmark 1,622.
Oxides and hydroxides	31,414	27,724	3	Hungary 14,564; West Germany 7,685.
Metal including alloys:				
Scrap	6,080	8,668	--	U.S.S.R. 5,215; Norway 2,843.
Unwrought	28,750	27,216	345	U.S.S.R. 11,035; Norway 4,150.
Semimanufactures	26,901	28,190	83	Sweden 5,352; Norway 5,105; West Germany 4,754.
Antimony: Metal including alloys, all forms	20	16	--	Belgium-Luxembourg 7; United Kingdom 5.
Arsenic: Oxides and acids	1,644	1,555	--	All from Sweden.
Beryllium: Metal including alloys, all forms value, thousands	$2	$16	$3	West Germany $13.
Cadmium: Metal including alloys, all forms do.	$3	$1	NA	NA.
Chromium:				
Ore and concentrate	20	131	--	All from U.S.S.R.
Oxides and hydroxides	737	778	15	West Germany 403; China 139.
Cobalt:				
Oxides and hydroxides value, thousands	$4	$3	NA	NA.
Metal including alloys, all forms	252	2	--	Mainly from Belgium-Luxembourg.
Columbium and tantalum: Metal including alloys, all forms, tantalum value, thousands	$4	$27	--	Austria $13; United Kingdom $7.
Copper:				
Ore and concentrate	53,626	74,305	--	Norway 24,526; Chile 21,296.
Oxides and hydroxides	245	308	--	Austria 216; West Germany 40.
Sulfate	2,084	3,101	--	U.S.S.R. 1,555; Belgium-Luxembourg 527.
Metal including alloys:				
Scrap	2,004	2,318	878	Sweden 1,043; United Kingdom 229.
Unwrought	20,420	18,827	--	Zambia 5,582; Zaire 5,504; U.S.S.R. 5,118.
Semimanufactures	15,024	13,140	105	Sweden 5,394; West Germany 3,826.
Gold:				
Waste and sweepings value, thousands	$100	$54	--	All from Sweden.
Metal including alloys, unwrought and partly wrought troy ounces	28,743	33,694	15	United Kingdom 19,869; Sweden 6,623.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite thousand tons	1,495	1,493	--	Sweden 1,055; U.S.S.R. 250.
Metal:				
Scrap	62,095	50,594	208	U.S.S.R. 40,617; United Kingdom 7,225.
Pig iron, cast iron, related materials	25,114	23,116	(2)	Sweden 8,277; West Germany 7,024.
Ferroalloys:				
Ferrochromium	2,592	1,233	--	Norway 479; Sweden 372; Zimbabwe 275.
Ferromanganese	3,606	5,465	--	Norway 5,161; West Germany 112.
Ferromolybdenum	287	186	--	Belgium-Luxembourg 40; Canada 38.
Ferrosilicomanganese	13,873	17,999	--	Norway 11,141; U.S.S.R. 6,822.
Ferrosilicon	9,195	8,838	--	Norway 5,337; U.S.S.R. 3,048.
Silicon metal	687	690	--	Norway 486; Sweden 200.
Unspecified	[r]7,586	9,253	--	Dominican Republic 3,638; New Caledonia 3,243.
Steel, primary forms	5,424	4,987	(2)	Netherlands 4,622; Sweden 154.
Semimanufactures:				
Bars, rods, angles, shapes, sections	249,321	252,711	115	Sweden 68,996; West Germany 27,207.
Universals, plates, sheets	183,962	225,276	13	West Germany 67,893; Sweden 26,519.
Hoop and strip	28,662	32,015	1	Sweden 14,308; West Germany 7,995.
Rails and accessories	4,845	2,011	--	Sweden 886; West Germany 849.
Wire	20,316	21,729	58	Sweden 6,244; Belgium-Luxembourg 5,002.
Tubes, pipes, fittings	128,725	116,546	350	West Germany 37,775; Czechoslovakia 12,470.
Castings and forgings, rough	3,053	3,327	116	Sweden 869; West Germany 842.

See footnotes at end of table.

Table 3.—Finland: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Lead:				
Ore and concentrate	1,053	1,993	--	Sweden 1,002; Canada 991.
Oxides	67	126	--	East Germany 59; West Germany 37.
Metal including alloys:				
Scrap	155	34	--	All from Sweden.
Unwrought	21,422	20,282	98	Sweden 9,088; U.S.S.R. 7,010.
Semimanufactures	635	781	--	West Germany 560; Belgium-Luxembourg 185.
Magnesium: Metal including alloys:				
Unwrought	59	50	--	All from Norway.
Semimanufactures	777	762	4	Norway 747.
Manganese:				
Ore and concentrate, metallurgical-grade	337	1,733	--	China 1,102; Netherlands 600.
Oxides	739	742	NA	Netherlands 316; China 165.
Mercury 76-pound flasks	116	1,102	--	West Germany 580.
Molybdenum:				
Ore and concentrate	454	488	88	United Kingdom 164; Canada 125.
Metal including alloys, all forms	4	6	2	Austria 2; Netherlands 2.
Nickel:				
Ore and concentrate	12,402	11,579	--	All from Norway.
Matte and speiss	6,271	7,853	--	Canada 4,809; Australia 3,026.
Metal including alloys:				
Scrap	1,449	1,959	133	Netherlands 628; United Kingdom 448.
Unwrought	2,460	2,869	389	U.S.S.R. 2,078; Canada 244.
Semimanufactures	106	157	13	U.S.S.R. 55; West Germany 37.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	1,800	2,829	NA	Sweden 1,061; United Kingdom 868.
Silver:				
Waste and sweepings[3] value, thousands	$120	$4	--	Norway $3.
Metal including alloys, unwrought and partly wrought thousand troy ounces	2,990	2,154	(2)	West Germany 1,093; United Kingdom 514.
Tin: Metal including alloys:				
Unwrought including scrap	191	194	--	West Germany 48; Netherlands 40.
Semimanufactures	123	140	--	United Kingdom 98; West Germany 22.
Titanium:				
Ore and concentrate	10,735	20,961	--	Norway 20,636; Netherlands 240.
Oxides	283	287	--	West Germany 147; Belgium-Luxembourg 60.
Tungsten: Metal including alloys, all forms	27	18	13	United Kingdom 3; West Germany 2.
Zinc:				
Ore and concentrate	135,547	207,835	--	Sweden 77,865; Canada 51,702; Greenland 31,598.
Oxides	475	400	--	West Germany 209; Sweden 120.
Blue powder	801	1,085	--	Norway 1,062.
Ash and residue containing zinc	1,551	7,355	--	West Germany 7,286; Sweden 59.
Metal including alloys:				
Scrap	62	10	--	All from West Germany.
Unwrought	453	462	--	West Germany 203; United Kingdom 146.
Semimanufactures	118	196	--	West Germany 60; Norway 76.
Zirconium: Ore and concentrate	60	86	--	Australia 58; United Kingdom 28.
Other:				
Ores and concentrates	57	51	27	West Germany 24.
Ashes and residues	2,138	2,474	391	Norway 1,600; Sweden 276.
Base metals including alloys, all forms	180	406	16	U.S.S.R. 206; Sweden 64.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	70	114	(2)	U.S.S.R. 63; Italy 36.
Artificial:				
Corundum	1,123	855	--	Austria 529; West Germany 170.
Silicon carbide	591	742	--	Norway 675; Italy 36.
Dust and powder of precious and semiprecious stones including diamond kilograms	10	23	--	U.S.S.R. 18.
Grinding and polishing wheels and stones	2,597	148	48	West Germany 54; Canada 23.

See footnotes at end of table.

Table 3.—Finland: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Asbestos, crude	3,573	4,291	9	Canada 1,902; Republic of South Africa 1,541; U.S.S.R. 574.
Barite and witherite	1,545	2,664	--	Norway 1,444; West Germany 749.
Boron materials:				
Crude natural borates	21,337	13,781	5,371	Turkey 7,500; West Germany 909.
Oxides and acids	677	296	24	China 180; U.S.S.R. 50.
Cement	8,545	12,814	12	Denmark 4,976; West Germany 3,014.
Chalk	18,033	24,050	2	Denmark 16,591; West Germany 2,619.
Clays, crude:				
Fire clay	12,933	15,290	--	United Kingdom 7,747; West Germany 5,367.
Kaolin	365,051	370,054	9,716	United Kingdom 342,452.
Unspecified	19,063	13,673	5,191	West Germany 4,591; United Kingdom 2,747.
Cryolite and chiolite	46	36	--	All from Denmark.
Diamond:				
Gem, not set or strung value, thousands	$9,328	$7,375	$116	Belgium-Luxembourg $3,577; Israel $2,047.
Industrial:				
Natural do	$75	$97	$4	Belgium-Luxembourg $57; Republic of South Africa $24.
Synthetic do	$206	$382	$366	Iran $8.
Diatomite and other infusorial earth	2,184	3,925	926	Norway 1,184; Iceland 590.
Feldspar, fluorspar, related materials	4,153	5,830	--	Mexico 4,698; United Kingdom 542.
Fertilizer materials:				
Crude, n.e.s	27	53	--	Chile 30; United Kingdom 23.
Manufactured:				
Ammonia	288,531	248,959	20,030	U.S.S.R. 196,975; United Kingdom 31,952.
Nitrogenous	26,601	31,207	471	U.S.S.R. 11,114; Norway 10,662.
Phosphatic	323	38	--	All from Denmark.
Potassic	298,150	309,004	--	East Germany 117,524; U.S.S.R. 116,561.
Unspecified and mixed	29,856	54,913	15	Hungary 29,558; Romania 21,886.
Graphite, natural	2,268	480	--	West Germany 244; United Kingdom 167.
Gypsum and plaster	139,662	134,190	51	Spain 102,766; U.S.S.R. 24,295.
Lime	1,246	325	(2)	Sweden 119; United Kingdom 104.
Magnesium compounds	16,775	19,973	96	U.S.S.R. 8,296; China 6,042.
Mica:				
Crude including splittings and waste	177	187	--	United Kingdom 159; Norway 22.
Worked including agglomerated splittings	29	23	--	Austria 12; West Germany 3.
Nitrates, crude	--	1,544	--	Chile 1,526; Switzerland 18.
Phosphates, crude	410,232	495,417	134,355	Algeria 131,027; Morocco 123,832; U.S.S.R. 106,202.
Phosphorus, elemental	5	4	--	All from West Germany.
Pigments, mineral: Iron oxides and hydroxides, processed	4,116	3,460	35	West Germany 3,367.
Precious and semiprecious stones other than diamond:				
Natural kilograms	785	1,967	--	India 1,500; West Germany 339.
Synthetic do	67	58	--	Austria 24; Switzerland 13.
Pyrite, unroasted	22	6	--	West Germany 3; Italy 3.
Salt and brine	721,283	639,386	1	Netherlands 295,506; Poland 104,199.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	88,245	76,307	2,835	East Germany 21,077; U.S.S.R. 16,135.
Sulfate, manufactured	24,464	9,604	NA	Sweden 6,176; Belgium-Luxembourg 3,331.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	3,478	1,028	54	Sweden 373; Norway 308.
Worked	442	718	11	Italy 345; Sweden 278; Portugal 60.
Dolomite, chiefly refractory-grade	13,584	21,612	--	Belgium-Luxembourg 16,163; Norway 2,586.
Gravel and crushed rock	10,496	10,725	--	Sweden 8,536; Denmark 836.
Limestone other than dimension	600,950	722,921	--	Sweden 710,076; Denmark 6,410.
Quartz and quartzite	143	83	35	Sweden 25; West Germany 20.
Sand other than metal-bearing	54,095	45,427	1	Belgium-Luxembourg 30,666.

See footnotes at end of table.

Table 3.—Finland: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Sulfur:				
Elemental:				
Crude including native and byproduct	52,824	68,825	--	Poland 41,890; West Germany 15,363.
Colloidal, precipitated, sublimed	19	12	--	Belgium-Luxembourg 10.
Dioxide	12,780	18,118	--	All from Sweden.
Sulfuric acid	80,398	5,113	--	U.S.S.R. 5,044; Netherlands 47.
Talc, steatite, soapstone, pyrophyllite	573	682	68	Belgium-Luxembourg 299; Sweden 105.
Other:				
Crude	62,843	71,348	276	Norway 70,258; U.S.S.R. 150.
Slag and dross, not metal-bearing	101,224	74,988	--	East Germany 32,996; Sweden 29,707.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	395	344	83	West Germany 120; Trinidad and Tobago 120.
Carbon:				
Carbon black	8,210	8,690	152	Sweden 3,465; Netherlands 2,601.
Gas carbon	531	567	--	West Germany 385; United Kingdom 181.
Coal:				
Anthracite thousand tons	112	90	--	U.S.S.R. 84.
Bituminous do.	5,538	4,594	678	Poland 2,071; United Kingdom 1,144.
Coke and semicoke do.	[r]1,113	1,139	--	U.S.S.R. 671; Sweden 209.
Gas, natural: Gaseous million cubic feet	28,487	23,885	--	All from U.S.S.R.
Peat including briquets and litter	5,666	7,434	--	U.S.S.R. 7,361; Sweden 73.
Petroleum:				
Crude thousand 42-gallon barrels	79,164	71,332	--	U.S.S.R. 58,172; Saudi Arabia 8,606.
Refinery products:				
Liquefied petroleum gas do.	67	51	--	Mainly from U.S.S.R.
Gasoline do.	105	114	([2])	Netherlands 68; West Germany 34.
Mineral jelly and wax do.	87	103	([2])	West Germany 55; U.S.S.R. 20.
Kerosine and jet fuel do.	42	53	([2])	Norway 35; U.S.S.R. 8.
Distillate fuel oil do.	7,802	8,323	--	All from U.S.S.R.
Lubricants do.	783	859	7	France 215; West Germany 171.
Residual fuel oil do.	9,947	8,739	--	All from U.S.S.R.
Bitumen and other residues do.	311	129	([2])	Denmark 69; Netherlands 54.
Bituminous mixtures do.	14	42	1	Sweden 36; France 2.
Petroleum coke do.	84	110	109	United Kingdom 1.

[r] Revised. NA Not available.

[1] Table prepared by W. L. Zajac.

[2] Less than 1/2 unit.

[3] May include platinum-group metals.

COMMODITY REVIEW

METALS

Chromium.—At Tornio, located at the foot of the Gulf of Bothnia, expansion of Outokumpu's ferrochrome works continued. The 60,000-ton-per-year operation was being upgraded to 170,000 tons per year by installing a 36-megawatt electric furnace. The program was expected to be completed in 1986 at a cost of $30 million, and also included the installation of some new equipment at the Kemi Mine to produce lump concentrate; the Kemi concentrator was scheduled to become operational in 1984.

Cobalt.—Outokumpu completed construction of a cobalt salt plant near the company's cobalt plant at Kokkola on the Baltic coast. Capacity of the plant is 1,800 tons of cobalt and nickel salts per year. The building of the plant improved Outokumpu's position in the very competitive cobalt market.

Copper.—The ore supply at Outokumpu's Virtasalmi copper mine has been depleted, and the mine was closed by the end of 1983. The company's Vuonos Mine was to be closed at the beginning of 1985. The Hammaslahti Mine at Pyhaselka could also operate until 1985.

Myllikoski closed its Luikonlahti copper mine, which also produced pyrrhotite, zinc concentrates, and cobalt-nickel concentrates that were sold to Outokumpu's smelters at Harjavalta and Kokkola. At present, the plant's flotation equipment is used for concentrating talc products mined at Sola and Polvijarvi.

Outokumpu signed an options agreement with A/S Sydvaranger of Norway for the purchase of its Bidjövagge copper mine, located in northern Norway, near the Finnish border. Outokumpu now has the option to take possession of the mine by 1985 and to reopen the property to ship copper concentrate to the company's Harjavalta smelter in southwest Finland. The Harjavalta smelter was expanded in 1982 to 80,000 tons per year, but the gradual decline of domestic copper mine output meant increasing dependence on imported copper.

In 1983, Outokumpu was installing at its Hammaslahti Mine the company's own preconcentrator based on gamma ray scattering by the metal content of the ores. An airblast activated by the gamma rays separates particles of ore of predetermined metal concentration from the gangue. The company calls this method the Precon method.

Outokumpu was the sole copper concentrate producer in Finland from seven of the company's nine mines. There were also two metallurgical works, Harjavalta and Kokkola, both near the Baltic Sea.

Iron and Steel.—Preparations were underway for the startup of stage two of the Kostamush (Kostamus) iron ore project in the U.S.S.R.'s Karelia District, which was built to mine and process 24 million tons of ore per year and to produce about 8.5 million tons of pellets per year. Rautaruukki Oy, the Finnish Government-owned integrated steel company, has been closely involved in the project, supplying 3,500 of the on-site work force. Rautaruukki is also to receive pellets from the mine, which has been supplying Soviet steelworks for more than a year from its first stage.

In 1983, Rautaruukki operated three iron-vanadium mines that delivered iron concentrates to the Raahe steelworks on the Gulf of Bothnia. Two of these, the Mustavaara and Otanmäki Mines, were expected to be closed in 1 or 2 years because of depletion of their resources.

Finland was to impose limits on steel imports from the Council for Mutual Economic Assistance (Comecon) countries. Previously, Comecon countries had agreed to reduce exports to Finland by 8%, but instead the amount of Comecon long products on the Finnish market doubled in 1983, leading to requests by Finnish steelmakers for positive measures.

Molybdenum.—Myllikoski made a molybdenum discovery in Inari, east of Evalo at Kivijärvi. The mine is near the Finnish-Soviet border and exploration began in cooperation with Soviet geologists.

Nickel.—Outokumpu continued construction work at its new Enonkoski Mine near Savolinna, south of the city of Outokumpu. Starting production in 1985, the mine is estimated to have ore reserves of 500,000 tons, sufficient for operating for 10 years. The company's Kotalahti Mine, to be exhausted by 1987, may be used to process ores from Enonkoski.

In 1984, an oxygen plant, built at Harjavalta by Oy Aga AB, was to be commissioned and was expected to help boost nickel and copper capacity of the Harjavalta plant.

Titanium.—Ilmenite production at Rautarauukki's iron ore mines decreased to 160,000 tons in 1983.

Vanadium.—Increased demand for vanadium in the world market made it possible to continue operation at Rautaruukki's Mustavaara vanadium mine until the end of 1984, instead of the earlier expected closing of spring 1984. The mine could easily be reopened later should the world market situation of vanadium change and the price improve. Mustavaara was the largest vanadium mine in Europe.

NONMETALS

Barite.—Concentration on an experimental basis began at Outokumpu's Pyhäsalmi Mine. The copper-zinc-pyrite ore contains 4% barite. Rising barite prices have, however, increased Outokumpu's interest in the mineral. About 30,000 tons is contained in the ore mined each year at the mine. If economical, normal production could start in the near future.

Calcium Carbonate.—Ruskelean Marmori Oy operated a limestone-dolomite mine at Louhi, 20 kilometers northeast of Savolinna. Capacity was about 250,000 tons per year, of which 200,000 tons was used for lime. Further, 30,000 to 40,000 tons of marble powder was produced, of which 20,000 tons was used as asphalt filler and 10,000 to 20,000 tons was used in agriculture. Karl Forsström Oy operated a 100,000-ton-per-year limestone mine at Sarkisalo. About 60,000 tons was used as fertilizer and animal feedstuff additive, while 40,000 tons of micronized material was used for paper coating. Oy Lohja AB used limestone for cement, and lime and ground products for agriculture and animal feedstuff, specialty glass, environmental protection, paper, and cellulose. The company's three quarries were at Tytyri, Mustio, and Sipoo, producing 850,000 tons, 350,000 tons, and 140,000 tons, respectively. Of this 1.34 million tons, 900,000 tons was used for cement, 250,000 tons for agriculture, 40,000 tons for lime, and the remainder was used for other purposes.

Cement.—Oy Partek AB remained Finland's leading cement producer as well as its leading limestone and burnt lime producer. Cement plants and capacities were as follows: Pargas, 710,000 tons per year; Lappeenranta, 480,000 tons per year; and Kolari, 210,000 tons per year. In total there were four coal-fired, dry-process kilns. Oy Lohja was the only other cement producer in Finland. The Virkkala 1-million-ton-per-year plant, 70 kilometers west of Helsinki, was supplied with limestone from the nearby Tytyri underground mine. One dry-process kiln and three converted from wet- to dry-process kilns were all coal fired. In 1981, Finnish kilns used coal at the rate of an estimated 1,550 gigacalories per year.

Phosphorus.—Kemira Oy's Sokli apatite mine in the north of the country was awaiting higher prices to start hoisting because, at present, operations of the mine were uneconomical despite sufficient domestic demand for phosphates.

Pyrite.—It was expected that increased demand for pyrite would make Outokumpu's Pyhäsalmi Mine profitable again. By 1985, $5 million was to be used to deepen the shaft. Originally, the Pyhäsalmi Mine was a pyrite mine. However, in the 1970's, copper and zinc became the more important products of the mine. At present, the mine can produce 25,000 tons of copper concentrates, 40,000 tons of zinc concentrates, and 400,000 tons of pyrite.

Sulfuric Acid.—Outokumpu and Kemira were to build a new sulfuric acid plant in Harjavalta. Technical assistance comes from Kemira and Monsanto Co., of the United States. A capacity of 200,000 tons per year was to be added to the old plant.

Talc.—After the closing of Myllikoski's Luikonlahti copper mine near Kaavi, talc production continued at the mine and geological research was continued in the mine area.

MINERAL FUELS

In 1983, Finland's total apparent consumption of primary energy was about 30 million tons of standard coal equivalent, of which 54% was oil, 21% was coal, 7% was nuclear fuel, and 3% was natural gas, totaling 85% for imported energy. The rest was domestically generated energy such as hydropower, fuelwood, and peat.

Natural Gas.—An agreement was signed between Neste Oy, the Government-owned Finnish oil company, and Soyuzgasexport of the U.S.S.R. regarding the price of the natural gas to be delivered through a new pipeline from the U.S.S.R. to Finland. Construction of the new extended line depends on the outcome of negotiations between the Government and the potential users such as the municipalities along the new line. At present, a line extends from Immatra at the Soviet border for 125 kilometers to Kouvola. It was estimated that the price of natural gas was lowered by the contract by 15%, according to a complicated formula tying it to that of domestic energy. The consumer price was $5 per 1,000 cubic feet. Construction of the extended pipeline stretching to Porvoo-Helsinki and Lahti-Tampere-Pori-Uusikaupunki was estimated to cost $170 million, 30% paid for by Neste, 20% by the U.S.S.R., and the remainder by the Finnish Government.

Nuclear Power.—In 1983, Finland had four operating nuclear powerplants. Loviisa 1, operated since 1977 by Imatran Voima Oy, was built by Atomenergoexport of the U.S.S.R. and was a pressurized water reactor of 420-megawatts nominal capacity located about 80 kilometers east of Helsinki. Loviisa 2, identical to Loviisa 1, had been operating since 1980. Olkiluoto 1 had been operated since 1978 by Tellisuuden Voima Oy (TVO) and was built by ASEA-ATOM of Sweden and was a heavy water-type reactor of 660 megawatts nominal capacity located on the west coast of Olkiluoto Island, 13 kilometers north of Rauma. Olkiluoto 2, identical to Olkiluoto 1, was commissioned in 1980. In 1982, nuclear power provided 42.4% of all electricity generated in Finland or 16 million megawatt hours, replacing 6.3 million tons of coal. There were plans to expand Finland's nuclear-generating capacity by a 1,000-megawatt unit.

TVO has decided to bury its nuclear waste in Finland because the cost of reprocessing abroad would be too high. It was estimated by TVO that processing the waste and storage would cost $600 million, while reprocessing would cost twice as much. Temporary burial sites would be near the powerplants, and final burial would be in rock caves at 500 meters depth.

Petroleum.—Use of light fuel oil declined during the last few years by about 10.5

million barrels, one-half of which was saved by converting to electric heating in smaller houses. The surplus oil was available for reexport. About one-third of all small houses were electrically heated and the rest used mostly oil. Neste was Finland's sole oil company.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Finnish markka (Fmk) to U.S. dollars at the rate of Fmk5.30=US$1.00, the average rate in 1983.

The Mineral Industry of France

By Roman V. Sondermayer[1]

For the mineral industry of France, including its processing sector, 1983 was a year of financial difficulties and organizational changes. Performances of the industry were mixed.

France remained a large processor of imported crude minerals and petroleum. Domestic mine production remained modest when compared with the country's demand. The most prominent minerals and metals produced in France during 1983, with production expressed in approximate ranges of percentages of world production were as follows: arsenic, 19% to 20%; diatomite, 14% to 15%; gypsum, 8% to 9%; potash, 6% to 7%; fluorspar, feldspar, and ferroalloys, 5% to 6% each; bromine, cadmium, talc, and zinc metal 4% to 5% each; magnesium metal and alumina, 3% to 4%; and iron ore, gross weight, and bauxite, 2% to 3% each. In the domestic economy the mineral processing sector, including fuels, was by far more important than the extractive sector. The share of the mineral and processing industry in the gross domestic production was about 10% in 1982, the latest year for which complete data were reported by the French Government.[2]

The Government continued its efforts to revitalize the mineral industry and ensure the supply of raw materials to industry. Work on an inventory of mineral resources was among the top projects for ensuring the supply of needed metal containing minerals. The reorganization that started after nationalization in 1981-82, continued during 1983. The large conglomerate, Société Imetal (Imetal) divested itself of its holdings in Société Métallurgique Le Nickel (SLN) and at yearend had only a 15% interest in SLN, compared with full ownership previously. In addition, it appeared that Imetal was under the control of Compagnie Générale des Matières Nucléaires (COGEMA) at yearend. Péchiney Ugine Kuhlmann (PUK) retained activities related to aluminum and nonferrous metals, but all PUK's steel and chemical activities were given up. The Compagnie Française des Pétroles (CFP), after combining its mining division with Dong Trieu and Minatome, became second to COGEMA as a producer of uranium in France. The electrolytic zinc plant at Auby and other activities of the Compagnie Royale Asturienne des Mines SA of Belgium were taken over by its French subsidiary, Asturienne France SA Restructuring of the French steel industry continued and reportedly should be completed in 1984.

The work on the inventory of mineral resources continued under the leadership of the Bureau de Recherches Géologiques et Minières (BRGM), the principal Government organization for mineral-related activities. During 1983, about 500 chemical anomalies were identified in the territory of France; 45 were explored and surface samples were taken and 39 sites were cored. Six sites that were promising, with positive results, were offered to companies for future development.

The principal events in the mineral industry included closure of aluminum plants in Savoie and Pyrénées and an antimony mine in Quimpere; discovery and exploration of a modest deposit of sulfide ores at Chessy; end of production at a barite mine at Porres and a plant at Les Arcs in Var; start of development of a fluorspar deposit at Moulinal in Tarn; and the decline of total petroleum refinery capacity by about 0.5 million barrels per day.

PRODUCTION

The mineral industry of France was privately owned and also Government owned or controlled. Most of the companies—PUK, Imetal, COGEMA, CFP, Charbonnages de France, and Union Sidérurgique du Nord et de l'Est de la France (Usinor)—were among the prominent mineral producers in which the Government held the majority of shares. Production of minerals showed mixed results but declines in output outnumbered the increases. This reflected a slow economic year in France and in Europe.

Table 1.—France: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum:					
Bauxite, gross weight thousand tons	1,970	1,921	1,827	1,662	[3]1,661
Alumina:					
Crude do.	1,238	1,339	1,236	1,087	[3]1,009
Calcined do.	1,069	1,173	1,095	960	[3]853
Metal:					
Primary do.	395	432	436	390	[3]361
Secondary do.	161	170	156	154	[3]158
Antimony:					
Mine output, metal content	--	--	312	308	--
Metal, smelter	4,000	3,885	5,223	5,867	6,000
Arsenic, white[e]	5,550	5,300	5,200	6,000	[3]4,700
Cadmium metal	689	789	663	793	--
Cobalt metal including powder	771	676	447	568	540
Copper:					
Mine output, metal content	97	116	98	199	200
Metal:					
Blister, secondary	5,000	7,300	6,500	8,100	8,000
Refined:					
Primary	22,000	23,000	23,000	[r] [e]24,000	22,000
Secondary	23,350	23,500	23,000	[r] [e]23,060	21,860
Total	45,350	46,500	46,000	47,060	[3]43,860
Gold, mine output, metal content troy ounces	54,109	37,391	36,362	[e]37,000	37,000
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	31,627	28,981	21,598	19,391	[3]15,966
Metal content do.	9,800	9,100	6,800	6,186	[3]5,172
Metal:					
Pig iron do.	19,415	19,159	17,268	15,031	[3]13,856
Ferroalloys:					
Blast furnace: Spiegeleisen and ferromanganese do.	449	480	313	333	[3]276
Electric-furnace:					
Ferromanganese do.	13	21	10	[e]11	10
Ferrosilicon do.	272	246	189	169	160
Silicon metal do.	55	60	60	[e]55	50
Ferrochrome do.	95	45	27	12	10
Other do.	136	123	115	101	100
Total[4] do.	1,020	975	714	681	606
Steel ingots and castings do.	23,360	23,176	21,258	18,416	[3]17,623
Semimanufactures do.	23,360	20,998	18,780	16,431	[3]15,348
Lead:					
Mine output, metal content	29,270	28,360	17,200	5,859	[3]1,512
Smelter, primary only	129,100	126,800	128,600	122,700	[3]114,948
Refined:[5]					
Primary: Soft lead	129,100	126,800	128,600	122,700	[3]114,948
Secondary:					
Soft lead	24,800	30,912	35,319	22,400	[3]37,464
Lead content of antimonial lead	65,800	61,089	64,119	63,500	62,000
Total	219,700	218,801	228,038	208,600	[3]214,412
Magnesium metal including secondary	9,040	9,328	7,263	9,610	10,000
Nickel metal, Ni content of metallurgical products (pure nickel, ferronickel, nickel oxide)	3,320	[r]7,974	10,051	[6]7,361	[6]7,300

See footnotes at end of table.

Table 1.—France: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS —Continued					
Silver:					
Mine output, metal content thousand troy ounces	[r]76	[r]89	[r]88	115	120
Metal, Ag content of final smelter products do.	7,428	[r]7,974	9,729	30,955	30,000
Tin, smelter output of solder and other alloys, secondary	9,410	8,900	7,438	6,141	[3]6,708
Tungsten concentrate, metal content	590	577	591	727	730
Uranium:					
Mine output, metal content	2,771	3,172	2,550	3,020	3,000
Chemical concentrate, U_3O_8 equivalent	3,332	2,845	2,554	2,872	2,800
Zinc:					
Mine output, metal content	37,000	35,810	37,429	37,021	[3]33,972
Metal including secondary:					
Slab	248,620	252,800	257,130	243,800	[3]249,828
Dust	8,790	8,390	9,250	[e]9,000	[3]11,376
NONMETALS					
Barite	170,000	236,560	190,150	143,324	140,000
Bromine, elemental	19,000	16,480	[e]16,500	[e]29,000	30,000
Cement, hydraulic thousand tons	28,825	29,104	28,229	26,150	[3]24,353
Clays:					
Bentonite[7]	[r] [e]3,000	[r] [e]3,100	[r] [e]3,000	3,290	[3]3,091
Kaolin and kaolinitic clay (marketable) thousand tons	315	338	331	[e]300	[3]345
Refractory clay, unspecified do.	1,560	1,601	1,457	[e]1,300	[3]1,082
Diatomite do.	200	220	210	244	[3]221
Feldspar, crude do.	195	210	191	173	175
Fluorspar:					
Crude do.	506	529	524	451	396
Marketable, all grades do.	259	259	256	244	196
Gypsum and anhydrite, crude do.	6,127	6,491	6,204	6,039	[3]5,544
Kyanite, andalusite, related materials[e]	30,000	30,000	30,000	30,000	30,000
Lime: Quicklime, hydrated lime, dead-burned dolomite thousand tons	3,870	3,610	3,366	6,000	5,500
Mica[e]	7,000	7,000	[r]7,000	7,000	7,000
Nitrogen: N content of ammonia thousand tons	2,150	[e]2,085	2,250	[e]2,000	1,900
Pigments, mineral, natural: Iron oxides[e]	16,500	[r]6,000	15,000	[r]16,000	16,000
Phosphates:					
Phosphate rock (phosphatic chalk)	12,420	14,460	12,340	14,000	13,000
Thomas slag thousand tons	2,072	1,865	1,800	1,700	1,600
Potash:					
Gross weight (run-of-mine) do.	12,514	12,117	11,344	10,904	10,000
K_2O equivalent (run-of-mine) do.	2,075	2,039	1,969	1,824	1,700
K_2O equivalent (marketable) do.	1,921	1,894	1,831	1,704	1,600
Pozzolan and lapilli do.	559	465	450	NA	NA
Salt:					
Rock salt do.	572	301	298	382	282
Brine salt (refined) do.	1,188	1,113	1,092	1,071	1,074
Marine salt do.	1,802	1,275	[e]1,300	1,539	1,350
Salt in solution do.	4,495	4,415	3,870	3,711	4,239
Total do.	8,057	7,104	6,560	6,703	6,945
Sodium compounds:					
Sodium sulfate do.	152	150	[e]150	[e]150	150
Sodium carbonate do.	1,550	1,560	[e]1,600	[e]1,000	1,000
Stone, sand and gravel:					
Limestone, agricultural and industrial do.	6,606	6,603	5,407	5,854	6,625
Roadbuilding, foundation, and ballast material excluding alluvial sand and gravel:					
Ballast and road surfacing do.	21,720	24,600	NA	NA	NA
Other do.	65,720	69,150	NA	NA	NA
Slate, roof do.	86	95	88	NA	51
Sand and gravel:					
Industrial sands do.	6,327	6,604	6,046	5,486	3,560
Other sand and gravel, alluvial do.	207,990	215,280	218,300	210,630	194,900
Sulfur, byproduct:					
Of natural gas do.	1,940	1,838	1,701	1,815	1,800
Of petroleum do.	188	226	221		
Of unspecified sources[e] do.	160	150	120	110	100
Total do.	2,288	2,214	2,042	1,925	1,900

See footnotes at end of table.

Table 1.—France: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Talc:					
Crude	268,350	320,790	313,140	312,920	[3]262,680
Powder	302,470	301,580	309,270	276,440	250,000
MINERAL FUELS AND RELATED MATERIALS					
Asphaltic material[8]	51,420	50,460	54,020	50,230	NA
Carbon black[e]	180,000	170,000	170,000	NA	NA
Coal including briquets:					
Anthracite thousand tons	3,020	[9]18,136	[9]18,588	[9]16,896	[9]16,992
Bituminous do.	15,597				
Lignite do.	2,454	2,558	2,945	3,060	[3]2,604
Total do.	21,071	20,694	21,533	19,956	19,596
Briquets do.	2,134	1,757	1,596	1,320	[3]1,512
Coke, metallurgical do.	11,615	11,118	10,723	9,935	[3]8,880
Gas, natural:					
Gross million cubic feet	392,499	382,820	358,936	369,054	370,000
Marketed do.	273,687	265,922	249,900	258,321	250,000
Natural gas liquids:					
Natural gasoline and condensate thousand 42-gallon barrels	3,981	NA	4,199	3,851	3,800
Propane do.	1,669	NA	1,461	1,658	1,600
Butane do.	1,790	NA	1,786	1,430	1,400
Total do.	7,440	7,394	7,446	6,939	6,800
Peat[e] thousand tons	140	140	130	120	110
Petroleum:					
Crude thousand 42-gallon barrels	8,775	10,375	12,288	12,011	[3]12,093
Refinery products:					
Gasoline:					
Aviation do.	348	264	223	560	[3]352
Motor do.	161,670	157,485	151,657	142,706	[3]136,425
Jet fuel do.	35,192	36,667	35,152	32,392	[3]35,797
Kerosine do.	884	1,054	1,449	938	[3]1,434
Distillate fuel oil do.	326,710	267,655	242,293	212,580	[3]181,802
Residual fuel oil do.	246,540	215,723	176,244	128,771	[3]115,983
Lubricants do.	10,427	10,860	9,279	8,895	[3]9,254
Liquefied petroleum gas do.	33,489	36,048	31,320	29,626	[3]28,037
Bitumen do.	20,150	19,453	17,853	7,491	[3]14,550
Unspecified do.	[e]87,950	[e]79,250	9,608	12,576	[3]1,751
Refinery fuel and losses do.	54,691	56,832	45,312	40,064	[3]40,020
Total do.	978,051	881,291	720,390	616,599	[3]565,405

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1] Table includes data available through Oct. 5, 1984.

[2] In addition to the commodities listed, France also produces germanium from domestic ores and has been described as the world's leading producer of this commodity in French sources. Output was reported as 14 metric tons in 1980, all from the Saint-Salvy Mine. Unfortunately, actual output is not regularly reported, and the ore from this mine is not sufficiently uniform in grade to permit estimates of output based on reported concentrate production. In addition, France produces large quantities of stone but statistics on output are not available for 1978-82.

[3] Reported figure.

[4] Series revised to include blast furnace ferroalloys and silicon metal, both hitherto counted separately.

[5] Series revised to eliminate a small duplication of counting between secondary soft lead and secondary antimonial lead.

[6] From 1982 nickel metal in cathodes only.

[7] Includes smectic clay.

[8] Excludes bituminous material produced by oil refineries.

[9] Includes anthracite.

TRADE

During 1983, France had an overall negative trade balance. Imports of all commodities totaled about $104.9 billion[3] and exports totaled $94.3 billion. Trade in minerals and fuels also had a negative balance. Imports totaled $35.9 billion or 34.2% of the total imports, and exports totaled $12.9 billion or 13.7% of the total country exports. Most of the mineral imports were petroleum and petroleum refined products, which accounted for 57.9% of total mineral and fuel imports or 19.8% of all imports of France.

France had a positive trade balance with the United States in minerals and related commodities. Trade in minerals, both imports and exports, was less than 1% of total trade. Exports to the United States were valued at $0.9 billion. Iron and steel products and nonferrous metals were the most valuable exports. Imports from the United States, $0.5 billion, were mostly fuels. Coal, followed by petroleum refinery products, were the principal mineral imports. For a long time the United States was the leading exporter of coal to France, but in 1983 the Federal Republic of Germany replaced the United States as the largest coal supplier to France.

Table 2.—France: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	31	--		
Alkaline-earth metals	377	322	12	West Germany 138; Belgium-Luxembourg 76.
Aluminum:				
Ore and concentrate	6,628	92,369	--	U.S.S.R. 82,871; Sweden 3,164.
Oxides and hydroxides	239,000	281,032	5,036	Netherlands 157,240; Spain 29,923.
Metal including alloys:				
Scrap	48,986	60,757	--	West Germany 19,443; Italy 19,162.
Unwrought	190,462	182,683	2,102	West Germany 38,683; Italy 38,129.
Semimanufactures	248,356	265,319	10,591	West Germany 71,177; United Kingdom 30,008.
Antimony:				
Ore and concentrate	271	177	NA	Spain 77.
Metal including alloys, all forms	77	77	NA	Belgium-Luxembourg 27; Senegal 14.
Arsenic: Metal including alloys, all forms	87	90	NA	NA.
Bismuth: Metal including alloys, all forms	8	3	--	NA.
Cadmium: Metal including alloys, all forms	251	361	65	Belgium-Luxembourg 187; West Germany 74.
Chromium:				
Ore and concentrate	2,035	1,554	--	Spain 969; Italy 494.
Metal including alloys, all forms	774	590	20	West Germany 172; Belgium-Luxembourg 102.
Cobalt: Metal including alloys, all forms	805	780	179	West Germany 145; Italy 71.
Columbium and tantalum: Metal including alloys, all forms, tantalum	22	23	7	West Germany 5; United Kingdom 4.
Copper:				
Ore and concentrate	801	648	--	Mainly to West Germany.
Matte and speiss including cement copper	^{r}1,861	3,146	NA	Belgium-Luxembourg 2,322; West Germany 575.
Metal including alloys:				
Scrap	108,188	112,338	18	West Germany 42,387; Belgium-Luxembourg 28,332.
Unwrought	23,535	11,789	--	Belgium-Luxembourg 4,407; Italy 3,023.
Semimanufactures	251,831	243,413	8,904	West Germany 58,073; Italy 32,815.
Germanium: Metal including alloys, all forms value thousands	$704	$2,209	$378	United Kingdom $1,696.
Gold:				
Waste and sweepings do.	$19,084	$17,767	--	Spain $15,871.
Metal including alloys, unwrought and partly wrought troy ounces	^{r}741,684	802,867	354	Switzerland 427,444; United Kingdom 258,942.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite thousand tons	6,378	5,836	(2)	Belgium-Luxembourg 5,445.
Metal:				
Scrap do.	3,184	3,082	(2)	Italy 2,116; Spain 660.
Pig iron, cast iron, related materials	^{r}241,637	223,816	4,290	Italy 57,028; Belgium-Luxembourg 51,430.
Ferroalloys:				
Ferrochromium	4,742	605	--	West Germany 210; Italy 104.
Ferromanganese	383,596	177,151	61,156	Italy 39,103; West Germany 26,760.
Ferromolybdenum	1,115	829	--	Netherlands 522; Italy 148.
Ferronickel	48,611	45,034	--	Italy 12,746; West Germany 10,838.

See footnotes at end of table.

Table 2.—France: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Ferroalloys —Continued				
Ferrosilicochromium	2,095	1,884	--	Italy 1,700.
Ferrosilicomanganese	11,507	5,657	958	West Germany 2,858; Belgium-Luxembourg 1,429.
Ferrosilicon	70,137	68,003	1	West Germany 21,927; Italy 13,929.
Unspecified	36,439	30,464	3,561	West Germany 5,851; Italy 3,325.
Steel, primary forms thousand tons	3,021	2,305	205	Italy 775; Spain 439.
Semimanufactures:				
Bars, rods, angles, shapes sections do	2,758	2,354	206	West Germany 442; Belgium-Luxembourg 288.
Universals, plates, sheets do	3,314	2,625	223	West Germany 509; Italy 352.
Hoop and strip do	495	431	8	West Germany 140; Italy 58.
Rails and accessories do	254	241	50	Italy 48; Saudi Arabia 20.
Wire do	193	191	32	West Germany 34; Saudi Arabia 15.
Tubes, pipes, fittings do	1,781	1,718	140	U.S.S.R. 199; Iraq 186; West Germany 126.
Castings and forgings, rough do	64	63	(2)	West Germany 20; Belgium-Luxembourg 16.
Lead:				
Ore and concentrate	140	44	--	Egypt 30.
Metal including alloys:				
Scrap	10,635	8,928	--	Italy 5,382; West Germany 2,286.
Unwrought	62,188	55,817	--	Belgium-Luxembourg 16,377; West Germany 15,527.
Semimanufactures	2,033	2,081	--	West Germany 644; Morocco 22.
Magnesium: Metal including alloys:				
Scrap	568	812	1	Italy 391; West Germany 273.
Unwrought	5,169	4,256	1,108	West Germany 714; Japan 531.
Semimanufactures	193	382	14	West Germany 223; Italy 90.
Manganese:				
Ore and concentrate, metallurgical-grade	17,243	11,136	--	Italy 4,497; Belgium-Luxembourg 2,009.
Metal including alloys, all forms	2,987	4,188	204	Italy 1,159; Sweden 649.
Mercury 76-pound flasks	725	232	--	Belgium-Luxembourg 116.
Molybdenum:				
Ore and concentrate	1,481	502	13	Netherlands 212; Belgium-Luxembourg 84.
Metal including alloys:				
Scrap	97	47	6	West Germany 13; Belgium-Luxembourg 11.
Unwrought	42	48	--	Netherlands 27; India 6.
Semimanufactures	41	70	1	Austria 29; West Germany 14.
Nickel:				
Matte and speiss	3	12	--	Portugal 7.
Metal including alloys:				
Scrap	2,461	2,064	204	West Germany 862; United Kingdom 507.
Unwrought	5,262	4,359	610	West Germany 1,314; Sweden 548.
Semimanufactures	4,513	5,244	613	West Germany 3,120; United Kingdom 277.
Platinum-group metals: Metals including alloys, unwrought and partly wrought:				
Palladium troy ounces	21,348	46,168	--	United Kingdom 3,697; Switzerland 2,669.
Platinum do	92,113	403,813	--	United Kingdom 272,574; West Germany 88,800.
Unspecified do	17,104	15,274	--	West Germany 6,752; Bulgaria 4,501.
Rare-earth metals including alloys, all forms	24	18	--	West Germany 10; Japan 2.
Rhenium: Metal including alloys, all forms value, thousands	$46	$65	--	Japan $50.
Silicon, high-purity	20	14	2	Netherlands 2.

See footnotes at end of table.

Table 2.—France: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Silver:				
Ore and concentrate value, thousands	[r]$661	$12	--	Sweden $11.
Metal including alloys, unwrought and partly wrought thousand troy ounces	[r]17,882	11,193	1,000	United Kingdom 5,152; Netherlands 1,279; West Germany 1,255.
Tellurium, elemental value, thousands	$81	$91	--	West Germany $87.
Tin:				
Ore and concentrate	36	19	--	All to Spain.
Metal including alloys:				
Scrap	656	472	--	Netherlands 212; West Germany 132.
Unwrought	[r]484	435	18	Netherlands 222; Italy 95.
Semimanufactures	327	265	7	Italy 42; Belgium-Luxembourg 31; Nigeria 31.
Titanium:				
Ore and concentrate	1,070	105	NA	Netherlands 33.
Oxides	2,495	14,054	3,088	West Germany 3,104; United Kingdom 902.
Metal including alloys:				
Scrap	758	484	--	United Kingdom 384.
Unwrought	2	3	NA	NA.
Semimanufactures	423	213	24	West Germany 46; Netherlands 30.
Tungsten:				
Ore and concentrate	760	930	160	Austria 334; West Germany 207.
Metal including alloys:				
Scrap	318	199	18	West Germany 76; Belgium-Luxembourg 48.
Unwrought	75	69	--	West Germany 39; Switzerland 14.
Semimanufactures	43	23	--	West Germany 5; Sweden 3.
Uranium and/or thorium: Metal including alloys, all forms, thorium	[r]5,487	5,017	1,041	U.S.S.R. 2,222; Japan 900; West Germany 372.
Vanadium:				
Ash and residue containing vanadium	112	56	NA	NA.
Metal including alloys:				
Scrap	53	23	--	NA.
Semimanufactures value, thousands	$16	$15	NA	NA.
Zinc:				
Ore and concentrate	50,642	58,633	--	Belgium-Luxembourg 46,421; Italy 9,814.
Blue powder	2,736	2,945	NA	West Germany 1,538; Italy 404.
Matte	2,998	2,978	--	Italy 1,018; Belgium-Luxembourg 744.
Metal including alloys:				
Scrap	7,861	11,407	--	Belgium-Luxembourg 4,783; Italy 3,676.
Unwrought	61,929	51,363	2,448	West Germany 17,368; Italy 8,591.
Semimanufactures	37,792	38,522	27	Belgium-Luxembourg 17,636; West Germany 14,133.
Zirconium: Ore and concentrate	97	18	--	West Germany 11; Switzerland 5.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1,165	1,525	--	Tunisia 119; Spain 86.
Artificial: Corundum	21,654	19,827	858	Italy 4,562; Austria 3,182.
Grinding and polishing wheels and stones	4,717	4,729	116	United Kingdom 867; West Germany 826.
Asbestos, crude	1,334	1,586	--	Tunisia 621; Senegal 420.
Barite and witherite	103,858	94,558	--	West Germany 83,073; Italy 3,910.
Boron materials:				
Crude natural borates	2,341	4,315	--	Spain 3,262; Italy 240.
Elemental value, thousands	$36	$71	NA	West Germany $66.
Cement thousand tons	2,844	3,032	118	Nigeria 455; West Germany 371.
Chalk	522,676	524,563	932	West Germany 196,227; Belgium-Luxembourg 119,769.
Clays, crude:				
Andalusite, kyanite, sillimanite	318	78	NA	NA.
Bentonite	12,630	15,304	--	Nigeria 1,991; West Germany 1,855.
Chamotte earth	179,859	164,686	--	Italy 58,923; United Kingdom 27,862.
Kaolin	167,284	139,029	--	West Germany 48,964; Italy 35,921.
Unspecified	347,855	309,942	--	Italy 151,494; West Germany 79,485.

See footnotes at end of table.

Table 2.—France: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Cryolite and chiolite	43	10	--	Italy 6; Morocco 4.
Diamond:				
Gem, not set or strung carats	43,091	93,426	47,533	Switzerland 24,865; Belgium-Luxembourg 15,972.
Industrial do	155,999	205,303	5,831	Ireland 114,084; Belgium-Luxembourg 77,990.
Dust and powder kilograms	2,277	44	NA	Italy 9.
Diatomite and other infusorial earth	26,978	26,999	--	West Germany 9,420; Belgium-Luxembourg 4,288.
Feldspar, fluorspar, related materials:				
Feldspar	58,571	54,613	NA	Belgium-Luxembourg 19,628; Spain 14,398.
Fluorspar	84,181	71,096	--	West Germany 31,785; Italy 25,561.
Unspecified	82	56	NA	NA.
Fertilizer materials:				
Crude, n.e.s	25,956	27,898	--	Switzerland 14,111; Belgium-Luxembourg 2,557.
Manufactured:				
Ammonia	244,117	103,808	--	West Germany 61,918; Spain 23,930.
Nitrogenous	^{r}660,885	539,995	--	Belgium-Luxembourg 86,217; Netherlands 76,952.
Phosphatic	^{r}228,098	175,118	--	Switzerland 70,518; Austria 43,835.
Potassic	^{r}367,064	465,563	--	Italy 94,193; West Germany 80,953.
Unspecified and mixed	^{r}413,461	405,324	--	West Germany 101,827; Belgium-Luxembourg 99,169.
Graphite, natural thousand tons	810	791	(2)	West Germany 491; Italy 94.
Gypsum and plaster do	1,144	1,146	--	West Germany 523; Belgium-Luxembourg 249.
Iodine	140	72	--	West Germany 24; Netherlands 13.
Lime	243,095	259,426	44	West Germany 147,530; Belgium-Luxembourg 68,472.
Magnesite	1,416	1,989	NA	NA.
Mica:				
Crude including splittings and waste	6,032	5,081	3	United Kingdom 1,642; West Germany 990.
Worked including agglomerated splittings	976	887	5	Switzerland 262; West Germany 249.
Nitrates, crude	1	31	--	Belgium-Luxembourg 24.
Phosphates, crude	3,440	3,804	--	Belgium-Luxembourg 2,871; West Germany 734.
Pigments, mineral:				
Natural, crude	^{r}86	292	NA	NA.
Iron oxides and hydroxides, processed	9,794	7,057	40	West Germany 1,168; United Kingdom 1,080.
Potassium salts, crude	8,807	11,892	--	Belgium-Luxembourg 9,278; Switzerland 2,080.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$53,122	$40,890	$1,819	Switzerland $30,040; United Kingdom $3,655.
Synthetic do	$12,795	$10,536	$1,153	Switzerland $6,316; West Germany $643.
Pyrite, unroasted	352	110	--	Republic of South Africa 54.
Quartz crystal, piezoelectric kilograms	202	(2)	NA	NA.
Salt and brine	235,310	493,741	109,929	Italy 183,022; West Germany 132,019.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	254,422	261,032	227	Sweden 26,079; Brazil 25,163.
Sulfate, manufactured	30,933	33,568	NA	Italy 16,361; West Germany 8,376.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	144,180	146,406	106	Belgium-Luxembourg 44,503; West Germany 34,706.
Worked	48,656	44,861	749	Belgium-Luxembourg 19,233; West Germany 9,394.
Dolomite, chiefly refractory-grade	32,421	33,751	--	Belgium-Luxembourg 11,472; West Germany 3,885.
Limestone other than dimension	209,167	338,516	--	West Germany 282,706.
Quartz and quartzite	2,343	2,603	180	West Germany 257; United Kingdom 138.
Sulfur: Elemental:				
Crude including native and byproduct	889,630	687,774	23	United Kingdom 240,684; Netherlands 105,485.
Colloidal, precipitated, sublimed	2,117	2,270	2	Belgium-Luxembourg 498; West Germany 489.
Talc, steatite, soapstone, pyrophyllite	73,913	75,785	341	West Germany 26,596; Belgium-Luxembourg 12,078.
Vermiculite	573	557	NA	NA.

See footnotes at end of table.

Table 2.—France: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	8,540	7,238	--	United Kingdom 3,170; Iraq 62.
Carbon: Carbon black	63,978	71,081	1	West Germany 19,161; Italy 14,975.
Coal:				
Anthracite	67,402	86,606	--	Belgium-Luxembourg 32,465; United Kingdom 26,655.
Bituminous	687,584	717,082	671	West Germany 513,811; Norway 67,784.
Briquets of anthracite and bituminous coal	26,443	17,097	--	Belgium-Luxembourg 10,577; United Kingdom 5,183.
Lignite including briquets	6,765	4,630	--	Spain 4,516.
Coke and semicoke	[r]965,394	822,774	--	West Germany 351,673; Austria 98,346.
Gas, natural: Gaseous million cubic feet	7,373	9,455	--	Austria 5,224; Belgium-Luxembourg 4,158.
Peat including briquets and litter	[r]493	891	--	Saudi Arabia 292; Switzerland 285.
Petroleum:				
Crude thousand 42-gallon barrels	1	4,264	(2)	Greece 2,584; Italy 1,392.
Refinery products:				
Liquefied petroleum gas do	8,944	8,009	1	Spain 3,065; Italy 1,547.
Gasoline do	19,109	15,430	224	West Germany 2,936; Netherlands 2,807.
Mineral jelly and wax do	365	309	3	West Germany 98; Netherlands 60.
Kerosine and jet fuel do	10,189	8,592	--	Switzerland 2,232; West Germany 1,106.
Distillate fuel oil do	24,670	23,152	(2)	West Germany 7,780; Switzerland 5,484.
Lubricants do	5,078	5,403	121	Belgium-Luxembourg 1,129; Nigeria 458.
Residual fuel oil do	47,646	26,977	341	Italy 12,642; United Kingdom 4,633.
Petroleum coke do	13	121	--	Italy 119.

[r]Revised. NA Not available.

[1]Table prepared by W. L. Zajac.

[2]Less than 1/2 unit.

Table 3.—France: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	92	131	NA	Netherlands 114; United Kingdom 10.
Alkaline-earth metals	11	37	--	NA.
Aluminum:				
Ore and concentrate thousand tons	1,989	1,253	--	Guinea 821; Australia 262.
Oxides and hydroxides	33,968	80,206	2,776	Guinea 47,565; West Germany 21,667.
Ash and residue containing aluminum	12,262	8,649	NA	West Germany 4,555; Italy 2,079.
Metal including alloys:				
Scrap	60,615	59,550	354	Belgium-Luxembourg 16,827; West Germany 14,770.
Unwrought	[r]300,670	351,990	4,596	Netherlands 71,789; West Germany 61,437.
Semimanufactures	200,301	215,738	2,012	West Germany 77,897; Belgium-Luxembourg 49,867.
Antimony:				
Ore and concentrate	10,998	8,844	--	Bolivia 3,593; Republic of South Africa 1,642.
Metal including alloys, all forms	552	1,143	1	China 488; Belgium-Luxembourg 190.
Arsenic: Metal including alloys, all forms	143	117	NA	Sweden 90; China 10.
Beryllium: Metal including alloys, all forms	3	29	2	West Germany 26.

See footnotes at end of table.

Table 3.—France: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Bismuth: Metal including alloys, all forms	288	197	14	Belgium-Luxembourg 64; United Kingdom 49.
Cadmium: Metal including alloys, all forms	598	618	--	Belgium-Luxembourg 258; Netherlands 147.
Chromium:				
Ore and concentrate	146,435	111,459	--	Republic of South Africa 50,415; Madagascar 26,874.
Metal including alloys, all forms	300	90	1	Japan 35; United Kingdom 32.
Cobalt:				
Ore and concentrate	6,460	5,767	--	Morocco 5,764.
Metal including alloys, all forms	1,133	1,721	144	Zaire 971; Zambia 129.
Columbium and tantalum: Metal including alloys, all forms:				
Columbium (niobium)	3	20	13	West Germany 6.
Tantalum	34	55	18	West Germany 12.
Copper:				
Ore and concentrate	8	298	--	Australia 33.
Matte and speiss including cement copper	13	70	--	All from Belgium-Luxembourg.
Metal including alloys:				
Scrap	29,618	28,745	523	West Germany 7,091; Belgium-Luxembourg 4,947.
Unwrought	412,108	395,175	2,052	Zambia 82,097; Belgium-Luxembourg 76,413; Chile 70,722.
Semimanufactures	169,953	182,719	1,702	Belgium-Luxembourg 68,919; West Germany 56,384.
Gallium: Metal including alloys, all forms	504	9	1	United Kingdom 4.
Germanium: Metal including alloys, all forms value, thousands	$1,399	$4,750	$3,930	Belgium-Luxembourg $738.
Gold:				
Waste and sweepings do.	$34,598	$7,163	$1,114	Switzerland $5,211; Spain $326.
Metal including alloys, unwrought and partly wrought thousand troy ounces	1,937	758	22	Switzerland 276; Netherlands 128.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	16,511	14,943	15	Brazil 3,889; Sweden 2,689; Mauritania 2,193.
Pyrite, roasted do.	63	52	--	Spain 23; Italy 20.
Metal:				
Scrap	347,429	273,020	1,085	West Germany 89,313; Belgium-Luxembourg 87,985.
Pig iron, cast iron, related materials	433,455	398,673	269	West Germany 331,924.
Ferroalloys:				
Ferrochromium	113,284	119,203	--	Republic of South Africa 49,944; Zimbabwe 23,770.
Ferromanganese	33,796	29,374	--	Norway 18,714.
Ferromolybdenum	1,630	1,269	11	Belgium-Luxembourg 685; Austria 300.
Ferronickel	83,279	73,555	24	New Caledonia 61,852.
Ferrosilicochromium	157	1,635	--	Zimbabwe 1,368.
Ferrosilicomanganese	34,275	30,942	--	Norway 15,350; Spain 7,346.
Ferrosilicon	28,720	29,075	--	Norway 13,198; West Germany 10,267.
Silicon metal	4,320	4,522	2	Norway 1,107; Spain 920.
Unspecified	3,172	3,246	43	West Germany 727; United Kingdom 670.
Steel, primary forms thousand tons	1,940	2,098	(2)	Belgium-Luxembourg 1,066; West Germany 461.
Semimanufactures:				
Bars, rods, angles, shapes, section do.	2,328	2,177	1	Italy 623; Belgium-Luxembourg 566.
Universals, plates, sheets do.	2,801	2,940	(2)	Belgium-Luxembourg 1,214; West Germany 718.
Hoop and strip do.	363	375	(2)	West Germany 174; Belgium-Luxembourg 128.
Rails and accessories do.	47	39	(2)	Belgium-Luxembourg 29.

See footnotes at end of table.

Table 3.—France: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Semimanufactures —Continued				
Wire thousand tons	187	194	(2)	Belgium-Luxembourg 66; West Germany 54.
Tubes, pipes, fittings do	602	583	2	West Germany 186; Italy 181.
Castings and forgings, rough do	50	51	(2)	West Germany 28; Italy 9.
Lead:				
Ore and concentrate	142,449	167,556	5,671	Republic of South Africa 66,470; Canada 20,881.
Metal including alloys:				
Scrap	21,055	19,836	--	Belgium-Luxembourg 9,466; Netherlands 7,373.
Unwrought	40,260	43,421	2,368	West Germany 11,864; United Kingdom 10,876.
Semimanufactures	1,205	2,632	82	Belgium-Luxembourg 1,603.
Lithium: Metal including alloys, all forms	6	8	NA	West Germany 7.
Magnesium: Metal including alloys:				
Scrap	329	353	--	Italy 141; West Germany 138.
Unwrought	4,210	4,237	971	Norway 2,711; U.S.S.R. 199.
Semimanufactures	327	313	18	Italy 203; Norway 41.
Manganese:				
Ore and concentrate, metallurgical-grade	880,817	921,816	71	Republic of South Africa 414,952; Gabon 370,438.
Metal including alloys, all forms	984	1,173	1	Republic of South Africa 974.
Mercury 76-pound flasks	[r]3,033	3,046	NA	Spain 1,305; China 812.
Molybdenum:				
Ore and concentrate	9,078	7,713	1,547	Canada 2,972; Chile 1,698.
Metal including alloys:				
Scrap	45	47	--	Italy 16; Austria 10.
Unwrought	18	47	4	Austria 29; West Germany 6.
Semimanufactures	55	72	7	Austria 34; Netherlands 20.
Nickel:				
Ore and concentrate	54	--		
Matte and speiss	19,374	10,756	3	New Caledonia 9,967; Australia 523.
Metal including alloys:				
Scrap	998	466	11	United Kingdom 193; Belgium-Luxembourg 70.
Unwrought	26,607	19,498	2,462	U.S.S.R. 6,003; West Germany 3,001.
Semimanufactures	6,697	4,577	792	United Kingdom 1,593; West Germany 1,306.
Platinum-group metals: Metals including alloys, unwrought and partly wrought:				
Palladium troy ounces	280,871	83,678	1,869	United Kingdom 39,975; U.S.S.R. 21,959.
Platinum do	179,017	199,036	2,990	United Kingdom 74,423; West Germany 41,801.
Unspecified do	36,073	34,443	3,306	Republic of South Africa 11,076; United Kingdom 5,060.
Rare-earth metals including alloys, all forms	64	76	NA	Austria 65; United Kingdom 3.
Selenium, elemental	87	46	NA	Canada 23; United Kingdom 13.
Silicon, high-purity	3	26	NA	West Germany 24.
Silver: Metal including alloys, unwrought and partly wrought thousand troy ounces	[r]21,336	18,446	175	Belgium-Luxembourg 3,230; United Kingdom 2,804; Switzerland 2,054.
Tellurium, elemental	10	10	4	United Kingdom 5.
Tin: Metal including alloys:				
Scrap	23	29	--	Switzerland 18; Belgium-Luxembourg 11.
Unwrought	8,910	8,557	125	Malaysia 2,353; Indonesia 2,043.
Semimanufactures	415	177	2	West Germany 77; Netherlands 46.
Titanium:				
Ore and concentrate	160,827	153,859	--	Australia 65,624; Republic of South Africa 62,338.
Oxides	14,373	13,920	4,994	Netherlands 3,307; West Germany 2,888.
Metal including alloys:				
Scrap	224	87	12	West Germany 36; United Kingdom 17.
Unwrought	1,037	1,374	188	Japan 1,135; West Germany 45.
Semimanufactures	2,087	1,435	456	Japan 696; United Kingdom 140.

See footnotes at end of table.

Table 3.—France: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Tungsten:				
Ore and concentrate	1,160	818	19	Portugal 167; Canada 162.
Metal including alloys:				
Scrap	46	122	--	Sweden 26; United Kingdom 23.
Unwrought	163	177	7	West Germany 67; Sweden 61.
Semimanufactures	51	66	4	United Kingdom 15; West Germany 14.
Uranium and/or thorium:				
Ore and concentrate	5,058	7,254	443	Australia 5,384; China 1,152.
Metal including alloys, all forms:				
Uranium	12,950	11,917	--	Niger 4,869; Republic of South Africa 2,653.
Thorium -- value, thousands	$21	$17	--	All from West Germany.
Vanadium:				
Ore and concentrate	(2)	117	--	Canada 11.
Metal including alloys:				
Scrap	45	3	NA	NA.
Unwrought	(2)	82	--	West Germany 77.
Zinc:				
Ore and concentrate	461,546	476,239	9,718	Peru 127,493; Canada 95,318.
Blue powder	2,279	1,033	NA	Belgium-Luxembourg 868.
Matte	2,881	2,894	NA	Belgium-Luxembourg 957; West Germany 954.
Metal including alloys:				
Scrap	8,877	5,433	49	Belgium-Luxembourg 3,072; Netherlands 1,174.
Unwrought	84,977	78,804	--	Belgium-Luxembourg 29,709; Netherlands 23,082.
Semimanufactures	8,431	8,650	2	West Germany 4,981; Italy 1,106.
Zirconium:				
Ore and concentrate	44,762	32,115	374	Australia 26,060.
Metal including alloys:				
Scrap	44	37	16	United Kingdom 21.
Unwrought	102	11	10	NA.
Semimanufactures	28	18	14	West Germany 4.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	35,181	26,822	679	Turkey 14,800; West Germany 5,953.
Artificial:				
Corundum	4,951	6,163	391	West Germany 3,922; Austria 569.
Silicon carbide	19,661	17,540	52	Norway 5,400; West Germany 4,240.
Dust and powder of precious and semi-precious stones excluding diamond kilograms	42	45	--	Belgium-Luxembourg 7; Netherlands 7.
Grinding and polishing wheels and stones	8,984	9,942	131	Italy 2,639; West Germany 1,906.
Asbestos, crude	102,318	83,639	554	Canada 40,856; U.S.S.R. 22,863.
Barite and witherite	12,935	18,884	--	West Germany 15,690; Spain 1,312.
Boron materials:				
Crude natural borates	141,028	123,847	74,762	Turkey 48,049; Netherlands 865.
Elemental	2	3	NA	Mainly from West Germany.
Bromine	2,348	4,209	NA	Israel 2,519; United Kingdom 965.
Cement	394,504	391,742	22	Belgium-Luxembourg 370,320.
Chalk	45,178	45,118	2	West Germany 23,001; Belgium-Luxembourg 21,440.
Clays, crude:				
Andalusite, kyanite, sillimanite	1,888	3,187	1,038	Republic of South Africa 854; West Germany 428.
Bentonite	89,112	99,081	14,872	Italy 40,826; Greece 29,322.
Chamotte earth	7,121	6,573	NA	West Germany 5,794.
Dinas earth	3,379	NA		
Kaolin	280,343	303,345	57,961	United Kingdom 212,629.
Unspecified	215,486	235,748	3,858	West Germany 176,627.
Cryolite and chiolite	740	675	--	Denmark 623.
Diamond:				
Gem, not set or strung thousand carats	646	1,109	31	Belgium-Luxembourg 817; India 88.
Industrial do	1,171	695	36	Ireland 270; Republic of South Africa 206.
Dust and powder kilograms	6,600	11,577	10,976	Switzerland 390; Republic of South Africa 183.
Diatomite and other infusorial earth	9,352	8,709	3,665	West Germany 3,328; Spain 961.

See footnotes at end of table.

Table 3.—France: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Feldspar, fluorspar, related materials:				
Feldspar	16,808	18,844	NA	West Germany 13,544; Portugal 2,988.
Fluorspar	12,308	1,571	NA	Italy 544; West Germany 409.
Unspecified	47,855	45,282	NA	Norway 42,631; Canada 1,474.
Fertilizer materials:				
Crude, n.e.s	23,932	31,338	14	Belgium-Luxembourg 18,438; Netherlands 5,758.
Manufactured:				
Ammonia thousand tons	181	186	(2)	West Germany 43; United Kingdom 32.
Nitrogenous do	^{r}1,723	2,168	204	Netherlands 1,047; Belgium-Luxembourg 624.
Phosphatic do	619	538	64	Belgium-Luxembourg 138; Tunisia 120.
Potassic do	352	356	--	Belgium-Luxembourg 121; Israel 115.
Unspecified and mixed do	1,711	1,748	112	Belgium-Luxembourg 801; Netherlands 421.
Graphite, natural	4,672	4,677	50	China 2,122; Italy 716.
Gypsum and plaster	23,284	33,298	51	Switzerland 14,332; Spain 11,294.
Iodine	899	1,032	NA	Japan 728; Chile 287.
Lime	125,417	102,194	--	West Germany 70,224.
Magnesite	106,414	79,567	917	Spain 29,891; Greece 20,937; Italy 9,254.
Mica:				
Crude including splittings and waste	4,922	5,464	621	India 2,157; Morocco 1,517.
Worked including agglomerated splittings	233	184	(2)	Belgium-Luxembourg 74; Switzerland 56.
Nitrates, crude	^{r}10,569	9,486	--	Chile 7,164; Netherlands 1,419.
Phosphates, crude thousand tons	4,622	4,455	704	Morocco 1,875; Israel 520.
Phosphorus, elemental	481	697	77	Italy 403; Canada 123.
Pigments, mineral:				
Natural, crude	^{r}511	611	NA	Spain 192; Austria 144.
Iron oxides and hydroxides, processed	30,959	33,132	441	West Germany 23,003; Belgium-Luxembourg 6,418.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$143,582	$101,898	$2,463	Switzerland $52,151; Thailand $14,544.
Synthetic do	$3,679	$3,014	$477	West Germany $969; Switzerland $636.
Pyrite, unroasted	755	1,429	19	Spain 741; Italy 600.
Quartz crystal, piezoelectric kilograms	90	6	NA	NA.
Salt and brine	160,781	169,353	18	Belgium-Luxembourg 77,763; Netherlands 38,841.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	54,911	58,821	22	Bulgaria 18,092; Poland 14,079.
Sulfate, manufactured	^{r}43,305	37,605	NA	Belgium-Luxembourg 27,750; West Germany 6,209.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	304,162	276,196	33	West Germany 70,809; Republic of South Africa 58,981.
Worked	259,641	251,072	13	Spain 134,917; Italy 81,245.
Dolomite, chiefly refractory-grade	362,511	331,597	NA	Belgium-Luxembourg 241,554; West Germany 64,341.
Limestone other than dimension	237,600	201,057	--	Belgium-Luxembourg 200,815.
Quartz and quartzite	52,095	50,532	520	Spain 37,269; Italy 8,681.
Sulfur: Elemental:				
Crude including native and byproduct	551,332	459,342	8,922	Poland 283,402; Canada 102,972.
Colloidal, precipitated, sublimed	256	111	(2)	West Germany 94.
Talc, steatite, soapstone, pyrophyllite	20,792	18,908	435	Italy 10,754; Belgium-Luxembourg 2,824.
Vermiculite	77,312	70,255	NA	Greece 24,208; U.S.S.R. 17,554.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	5,792	15,180	1,025	Belgium-Luxembourg 13,638.
Carbon: Carbon black	76,846	72,066	2,021	Netherlands 30,567; West Germany 29,295.
Coal:				
Anthracite thousand tons	1,489	1,054	54	West Germany 422; Republic of South Africa 360.
Bituminous do	25,882	20,802	8,182	Republic of South Africa 4,082; West Germany 3,491.

See footnotes at end of table.

Table 3.—France: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coal —Continued				
Briquets of anthracite and bituminous coal thousand tons	112	168	57	West Germany 94.
Lignite including briquets do.	160	146	--	West Germany 145.
Coke and semicoke do.	^{r}2,398	1,697	44	West Germany 1,445; Netherlands 144.
Gas, natural:				
Gaseous million cubic feet	^{r}626,531	497,595	--	Netherlands 244,507; U.S.S.R. 128,978.
Liquefied thousand tons	2,552	6,171	--	All from Algeria.
Peat including briquets and litter	114,013	158,162	17	West Germany 85,178; U.S.S.R. 33,697.
Petroleum:				
Crude thousand 42-gallon barrels	664,335	563,149	([2])	Saudi Arabia 203,403; Nigeria 51,150; Algeria 45,162.
Refinery products:				
Liquefied petroleum gas do.	41,336	83,734	818	Algeria 73,297.
Gasoline do.	37,875	48,306	164	Italy 9,609; Netherlands 5,292.
Mineral jelly and wax do.	334	159	15	West Germany 55; Netherlands 41.
Kerosine and jet fuel do.	455	933	27	United Kingdom 175; Brazil 155.
Distillate fuel oil do.	31,905	40,865	434	U.S.S.R. 11,580; Algeria 10,419.
Lubricants do.	1,029	1,191	40	Belgium-Luxembourg 165; Netherlands 157.
Residual fuel oil do.	49,035	56,012	4,114	U.S.S.R. 7,785; Yemen (Aden) 6,787.
Petroleum coke do.	6,684	8,017	7,262	United Kingdom 367; West Germany 239.

^{r}Revised. NA Not available.
[1] Table prepared by W. L. Zajac.
[2] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—The bauxite and alumina sectors had a quiet year. Lower production reflected a slowdown in the French economy and resulted from the closure of 40,000 tons of annual capacity at Saint-Jean-de-Maurienne in Savoie and 20,000 tons at Lannemezan in Hautes-Pyrénées. To replace the old plant at Saint-Jean-de-Maurienne, construction of a new 120,000-ton-per-year plant was planned. Reportedly, some parts of the old plant are to be used in the new one. As in the past, all aluminum smelters were operated by PUK.

Antimony.—The antimony mine and concentrator at Ty Gardien, Quimpere, owned by Société Cheni, a wholly owned subsidiary of Compagnie Française des Mines (Coframines) (BRGM 80% through Coframines) was closed during December 1983. With this closure, France again will import all antimony needed to meet its demand.

Copper.—France had minimal mine production of copper. However, exploration for metals led to the discovery of deposits of complex sulfide ores containing copper. Coframines started detailed underground exploration on a deposit at Chessy, in the Department of Rhône, about 359 meters of an incline were completed. Preliminary reports showed reserves of 3 million tons. The sulfide ore at Chessy averages 3% copper with some zinc. Société Nationale Elf Aquitaine (SNEA) and BRGM continued exploration of a sulfide deposit at Rouez, Sarthe. A deep exploratory hole has found, in the eastern lenticular body, a mineralized zone with higher metal content than the rest of the deposit. In a borehole, 40 meters of core showed 1% of copper, of which 2 meters had 2%.

Smelter production of France remained far below the country's copper demand and imports of copper metal were essential. Compagnie Générale de'Electrolyse du Palais operated a 45,000-ton-per-year copper electrolytic plant at Palais-sur-Vienne, Haute-Vienne, the only large electrolytic plant in the country.

Gold.—The largest producer of gold remained the mine at Aude operated by the Société des Mines et Produits Chimiques de Salsigne. Ore production reached 232,000 tons, of which 145,175 tons was opencast. Average gold content was 9.75 grams of gold per ton of ore. The metallurgical plant produced 10,035 tons of matte containing 1,701 kilograms of gold and 3,395 kilograms of silver. The management started to implement a program of modernization of the flotation plant, metallurgical installations, and the sulfuric acid plant, which should be completed by 1986.

Another gold producer was the mine at Bourneix, Haute-Vienne, operated by the Société Minière Bourneix S.A. in which Coframines held about 32% interest. During 1983, the Bourneix Mine reached its designed capacity and produced 48,750 tons of ore, yielding 1,923 tons of concentrate containing 533 kilograms of gold and 1,134 kilograms of silver. In addition, the company explored by drilling near the Gross-Gallet vein from which the Bourneix Mine was producing.

Iron and Steel.—After the legal process of nationalization had been completed in 1982, the French steel giants, Société Aciéries et Laminoirs de Lorraine (Sacilor) and Usinor, came under control of the Government. The state acquired 93% of the capital of Sacilor and 86% of Usinor. As the new owner, the Government undertook the task of restructuring the industry. The so-called "Plan Aciér" outlined the restructuring and modifications of the industry. However, because of worse conditions in the economy than those forseen in the plan and huge losses by the steel groups, the planned targets for 1986 had to be reconsidered. During 1983, studies were underway and the new organization was evaluated by the concerned partners. Reportedly, the plan should be finalized during 1984.

During 1983, France set up a new agency, "Fond d'Intervention Sidérurgique," which would borrow money on the market and lend it to Usinor and Sacilor at interest rates of 4.6%. The French Government is supposed to cover the difference between the market rates and the 4.6% interest rates.

Lead and Zinc.—Only two lead and zinc mines remained operational in France, Malines and Saint-Salvy, both of which were operated by Société Minière et Métallurgique de Peñarroya. Output of ore continued close to that of 1982 but the metal content was lower. In addition, BRGM and SNEA were exploring for lead and zinc in France. BRGM has released to companies the following deposits: La Haie Claire and Saint Fiacre in the Massif Armoricain; Sud les Farges in the Massif Central; and in the southwest of France, Arrenes and Bonciale. SNEA has confirmed zinc ores in the eastern part of the deposit at Rouez, Sarthe.

Tungsten.—Two mines, Salau and La Favière, produced tunsten during 1983. Increase in output resulted from the fact that the La Favière Mine operated the full year at capacity.

The principal producer of tungsten remained the Salau Mine, Ariège, operated by the Société Minière d'Anglade. Salau Mine produced 58,231 tons of ore with an average WO_3 content of 1.632%, which corresponds to an output of 950 tons of WO_3. The Montbeleux Mine was closed, according to unconfirmed reports. Production costs were high and the operation was uneconomic.

NONMETALS

Barite.—The French barite industry had a year marked by closures and lower production, reflecting slow activity in the industrial sectors consuming barite and exhaustion of deposits.

The Société des Couleurs Zinciques has closed its mine in the Province of Aveyron. In addition, the Société de Mines de Garrot stopped production of barite in its mine at Porres and plant at Les Arcs, both in the Province of Var. The largest producer of barite remained Société Barytine de Chaillac. The mine and plant at Chaillac produced about 100,000 tons of barite concentrate. In addition, particular efforts were made to resolve problems posed by treating clayey barite ores. The crushing mill had to be modified so that it could process clayey ores. Société des Produits Chimiques de Viviez produced about 34,880 tons of crude ore from the Lacan Mine at Bertholene, Aveyron. After processing, the preconcentrates showed an average content of 72.3% $BaSO_4$. Three exploratory wells were drilled to determine the extension of the ore body down to 150 meters. In the central shaft, at 142 meters, a 4-meter-thick vein assaying 66.2% $BaSO_4$ was discovered. The flotation plant produced 35,000 tons of concentrates averaging 90% $BaSO_4$.

Fluorspar.—A large number of companies and mines produced fluorspar in France but production was declining, mostly because of weak demand. The Société Général de Recherches et d'Exploitation Minières concluded environmental impact studies for a new mine to be developed on the Moulinal deposit, near the existing mine at Motro, Tarn. Opencast mining was planned to start production in 1984. Reportedly, reserves of the Moulinal deposit are 150,000 tons.

Potash.—During 1983, unspecified technical difficulties caused a drop in production in France for the first time in the history of potash mining. The Government-owned Mines de Potasse d'Alsace (MDPA), part of the Entreprise Minière et Chimique, produced all potash in France. MDPA continued to develop a method for solution mining in the deep part of the deposits in Alsace; the aim was to determine natural constraints existing in the deposits.

Talc.—The Talcs de Luzenac remained the only producer of talc in France, operating a mine at Trimouns, Ariège and a plant at Luzenac, also in Ariège. In the talc mill at Luzenac an optical sorter started operation and results were reported good.

MINERAL FUELS

Coal.—The coal industry of France, almost all operated by the Government-owned Charbonnages de France, had a slow year with lower demand for coal by Électricité de France. Demand for coal for production of electricity was lower by 2 million tons, because of the inroads of nuclear power. Imports also were down by about 4.6 million tons.

Petroleum.—The petroleum industry recorded increases in seismic exploration and domestic crude output, but lower exploratory drilling, lower imports of crude oil, and a reduction in refinery capacities. Seismic activities resulted in 7,055 kilometers of seismic profiles, roughly 732 kilometers more than in 1982. The Paris Basin, Alsace, and Jura were the principal regions of seismic activities.

Exploratory drilling recorded a total of 76,370 meters drilled, about 78% less than that of 1982. Average depth of exploratory wells was 2,070 meters compared with only 1,454 meters in 1982. Of the total, 13,379 meters were drilled offshore, of which 65% was in the Mediterranean Sea. On the ground, the Aquitaine and Paris Basins accounted for 95% of on-ground exploratory drilling.

Although exploratory drilling was lower than that of 1982, two discoveries were made. One was at Chaunoy in Seine-et-Marne, near Melun, a producing oilfield. The new discovery, an extension of the Melun Field, may increase production from 1.8 million barrels per year at present to 2.9 million barrels per year in 1985. The second discovery was at Saint-Just-Sauvage in the Department of Marne, east of Romilly-sur-Seine. The deposit tested at between 250 and 350 barrels per day at yearend 1983. Four offshore wells were negative; the regional well in the Gulf of Lion, drilled in 1,246 meters of water, was plugged at a depth of 5,354 meters.

For all practical purposes, output of liquid hydrocarbons, including natural gas liquids, remained the same as that of 1982. About 114 extension wells, totaling 161,633 meters, were drilled, mostly in the Paris and Aquitaine Basins.

There was a decline in total refinery capacity. Total capacity declined to 5.9 million barrels per day from 7.1 million barrels per day, mostly as the result of closure of two refineries, Grangeville and Bordeaux, and the stopping of production in older units of refineries at Petit Couronne, La Mede, and Berre.

Uranium.—France continued to develop the uranium sector of the energy industry in all levels of the production process, although at a slower pace.

In addition, restructuring and merging of some producers was accomplished. The Société Centrale de l'Uranium et des Minerais et Metaux Radioactifs explored the Gouzon (Creuse) deposit in detail and upgrading methods. In addition, drilling at the La Porte deposit, SNEA obtained negligible results in Saone et-Loire (Saint-Symphorien de Marmagne), in Marche (Charrioux, Les Combes), and in Beaujolais (la Berthandiere). Compagnie Minière Total (Total) conducted exploration in the Massif-Central, Aquitaine, Languedoc, and Roussillon.

In addition to exploration, Total absorbed Minatome S.A. in December 1983.

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[1] Physical scientist, Division of Foreign Data.

[2] Annuaire Statistique de la France. Paris, 1983, p. 833.

[3] Where necessary values have been converted from French francs (F) to U.S. dollars at an average rate of F7.6=US$1.00.

The Mineral Industry of Gabon

By Ben A. Kornhauser[1]

The increased price of higher valued battery-grade manganese dioxide in 1983 offset the lower priced manganese ore, thus maintaining the overall sales revenue of the previous year. A consortium headed by Amoco Gabon Exploration Co. struck oil in two promising offshore structures. Production from these and other new fields was expected to stabilize and possibly increase Gabon's oil production for the next 3 to 5 years.

Funding of the Trans-Gabon Railroad continued at an increased rate even though oil revenues had fallen in 1983. The second stage of the railroad from Booué to Franceville was begun; completion of the entire railroad was expected to cost $855 million.[2]

The Gabon economy was relatively stable even with the decline in the price of oil, which continued to be the mainstay of the economy.

PRODUCTION AND TRADE

As a result of the March 1983 adjustment in oil prices by the Organization of Petroleum Exporting Countries, Gabon's oil fell from about $35 to $29 per barrel, causing Gabon to scale back its projected development budget. However, the revised 1983 budget still was 10.4% and 23.4% greater than the 1982 total public operating expenditures and development budget, respectively. Of the $586 million development budget, $275 million was applied to the Trans-Gabon Railroad, upon which rested the country's expectations for progress. Construction of the second stage of the railroad from Booué to Franceville began in 1983. The railroad was scheduled to be completed in 1988.

The gross domestic product increased only to $3 billion compared with $2.9 billion, as revised by Gabon, in 1982. However, the 1983 drop in oil prices caused a budget deficit of $61 million, the first deficit since 1972, and a slight reduction in the balance-of-payments surplus. In 1983, petroleum contributed an estimated $1.8 billion of an estimated $2 billion of total mineral production value, about $1.4 billion or 80% of total export value, and about 66% of total state revenues.[3] Manganese and uranium exports amounted to about 5% and 4%, respectively, of total export value.

The Government's investments for electric power and water were estimated at $31 million. This sum included $7.8 million for expanding the Poubara hydroelectric project and $13.3 million for rural power and water systems.

Activity at the Port Gentil deep seaport was expected to recover since both the port and the Owendo-Booué section of the Trans-Gabon Railroad were operational.

Table 1.—Gabon: Production of mineral commodities[1]

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
Cement, hydraulic metric tons	96,205	109,430	149,913	175,103	180,000
Diamond, gem and industrial carats	25,193	NA	NA	NA	NA
Gas, natural:					
Gross million cubic feet	[e]64,000	[e]58,000	66,073	66,275	66,300
Marketed do	6,549	2,538	2,684	2,304	4,800
Gold, mine output, metal content troy ounces	964	553	[e]550	[e]550	550
Manganese:					
Ore, gross weight (50% to 53% Mn) metric tons	2,188,445	2,044,049	1,359,954	1,406,000	[3]1,761,752
Pellets, battery- and chemical-grade, gross weight (82% to 85% MnO_2) do	111,649	102,703	127,584	105,000	[3]94,834
Total do	2,300,094	2,146,752	1,487,538	1,511,000	[3]1,856,586
Petroleum:					
Crude thousand 42-gallon barrels	70,991	64,444	54,386	56,575	[3]56,813
Refinery products:					
Gasoline do	850	886	648	502	613
Jet fuel and kerosine do	740	1,391	728	721	721
Distillate fuel oil do	2,286	2,545	4,117	[e]2,246	1,566
Residual fuel oil do	4,150	4,140	2,182	[e]3,583	2,705
Other do	684	142	752	[e]717	66
Refinery fuel and losses do	274	14	20	[e]282	193
Total do	8,984	9,118	8,447	8,051	5,864
Uranium oxide (U_3O_8), content of concentrate metric tons	1,297	1,218	1,205	1,270	1,179

[e] Estimated. [p] Preliminary. NA Not available.

[1] Table includes data available through June 20, 1984.

[2] In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone) is also produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

COMMODITY REVIEW

METALS

Manganese.—The lower market value of manganese ore sales were offset by a 13.8% increase in the value of manganese dioxide, particularly for the Japanese and Indonesian markets. Manganese sales were expected to increase slightly owing to the opening of the Soviet market.

Elkem AS of Norway and its U.S. subsidiary, Elkem Metals Co. of Pittsburgh, PA, acquired a 6% share in Compagnie Minière de l'Ogooue S.A. (COMILOG) for approximately $5.5 million. COMILOG, a partly state-owned company, was a shareholder in Elkem through an affiliate. The 6% share was purchased from the United States Steel Corp. and French companies. After the purchase, the shareholding in COMILOG was 36% United States Steel Corp.; 20% Gabon Government; 17.6% Compagnie Française des Mines; 13% Imetal S.A.; 7.5% Société Auxiliare du Manganese de Franceville; and 6% Elkem. As a result, Elkem would obtain a dependable supply of high-quality ore for its ferromanganese operations through the agreement with COMILOG and would work jointly to improve the quality and efficiency of ferromanganese production.

After agreeing to a 15% reduction in the price of manganese ore, Gabon obtained orders for 70,000 tons of ore from Japan in 1983.

MINERAL FUELS

Petroleum.—Petroleum continued to dominate the economy. Oil production increased slightly owing to the offshore Oguendjo Field brought on-stream by a group led by Amoco Gabon Exploration Co. in August. This first Amoco production in Gabon came from two separate offshore structures, Oguendjo B and C, about 53 miles south-southwest of Port Gentil in about 90 feet of water. The development called for 13 wells on the 2 structures. The true vertical depth of the producing zone was 6,000 to 6,500 feet. Production started at about 15,000 barrels per day (bbl/d) and could reach 23,000 bbl/d by yearend 1983 and 40,000 bbl/d by yearend 1984. That production level would be a 27% increase in Gabon's production and would give Amoco and its partners 21% of the country's production. The partners involved and their interests were 49% Amoco; 18.13% Wintershall AG; 14.7% BP Petroleum Development Ltd.; 8.085% Preussag AG; 8.085% Lingen Exploration Inc.; and 2% Société National des Pétroles Gabonaise (state owned).[4] Burmah Oil of the United Kingdom, operator for a six-company group, was drilling the Longhi Marine-1 well 4 kilometers offshore and 40 kilometers south of Port Gentil. Three wells were drilled on the production-sharing permit between 1978 and 1982.[5]

Production of Essence et Lubrificants de France (ELF)-Gabon Oil Co.'s new fields in 1984 plus the rehabilitation of the field of Shell Gabon were expected to stabilize oil production for the next 3 to 5 years.

Refining.—A possible merger of Gabon's two refineries, Société Gabonaise de Raffinage and Compagnie Gabonaise-Elf de Raffinage, to permit a technical linkage of their installations was under review in 1983. Both refineries are at Port Gentil.

Uranium.—The value of Gabon's uranium exports was expected to decline 9% in 1983 to $65 million. Although exports of uranium concentrates were expected to fall by 9% compared with that of 1982, yellowcake production was estimated at 1,389 tons, an increase of 7.7% over 1982 production. The overproduction resulted in a 70% increase in Gabon's uranium stockpile.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Communauté Financière Africaine francs (CFAF) to U.S. dollars at the rate of CFAF400=US$1.00. The official CFAF exchange was maintained at 50 CFAF per French franc and was freely convertible.

[3] Paris Marches Tropicaux et Mediterraneens. No. 1989, Dec. 23, 1983, p. 3118.

[4] Oil & Gas Journal. V. 81, No. 37, Sept. 12, 1983, p. 72.

[5] Petroleum Economist. V. 51, No. 1, Jan. 1984, p. 40.

The Mineral Industry of the German Democratic Republic

By George A. Rabchevsky[1]

The mineral industry of the German Democratic Republic (GDR) continued to be an active contributor to the economy in 1983. The production of raw materials and mineral fuels contributed M30 billion[2] of total revenues of M192.4 billion. The potash and lignite mining industries were the most profitable, with industrial minerals, iron, and a few nonferrous metals producers also contributing to the economy. The coal industry alone generated M26.6 billion. The GDR's mineral industry, however, consisted primarily of minerals processing, based on imported raw materials stocks. The produced national income of the GDR increased by 4.4%, and total industrial production by 4.1%, slightly overfulfilling the prescribed plan. The industry contributed about 60% of the total produced national income. Less than 3% of the national income was produced by privately held enterprises. The increase in the national income was reportedly achieved mostly through an increase in labor productivity, which rose 5.6%. Although the GDR economy continued to perform well in comparison with that of other centrally planned economy countries, the Government lowered goals for the remainder of the 1981-85 plan period. Increased energy costs, decreased oil imports from the U.S.S.R., large global debts, and continuing problems in agriculture continued to restrict anticipated growth.

Since the country was relying more heavily on imports of raw materials and the use of scrap, a sizable portion of the 1983 research budget of M58 billion went to studies of the utilization of secondary raw materials and alternate sources of energy, representing 25% of total industrial investments. The domestic energy and material shortages also made exports the absolute priority for the reduction of outstanding debts. The GDR imported more than 60% of its raw material requirements.

In 1982, about 3.2 million, or 20% of the population, were working for the industry, of which the metallurgy and mining industry employed 137,433, and the energy and fuel industry, 217,717 workers. To meet the severe labor shortages, the GDR planned to install 40,000 to 45,000 domestically made robots and manipulators for the replacement of about 140,000 manual workers during 1981-85 to help achieve an overall 28% increase in total industrial production without any appreciable increase in the work force. The robotization program was also to help the GDR industry to improve the quality of its exports through greater precision in manufacturing processes while saving on unnecessary wastage of imported energy and raw materials. By the end of 1982, 18,000 robots and manipulators and 10 flexible manufacturing systems were reportedly installed in the country, many of those in the minerals industry.

PRODUCTION

The GDR continued to be a major producer of potash and lignite. Although indigenous metal resources were small, the country mined small quantities of copper, nickel, silver, and tin. Some crude oil and gas were produced from small fields in the northern part of the country. Although industrial production reportedly increased, industrial consumption of raw materials and energy was reduced considerably. The consumption of primary energy, for example, declined reportedly by 6% and that of raw materials by 8%.

Production of nonferrous metals reportedly rose during the 1976-80 5-year plan period and presumably during the 1981-85 period. Production increased by 24% at the VEB Mansfeld Kombinat "Wilhelm Pieck," by 25% at the VEB Bergbau-und Hüttenkombinat "Albert Funk," and also increased at VEB Aluminium Werke "Lauta" and at VEB Kupfer-Silber Hüttenkombinat "Hettstedt."[3]

Table 1.—German Democratic Republic: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum:					
Alumina:					
For metallurgical use	40,965	43,025	45,164	46,085	46,100
For other use[e]	19,000	20,000	20,000	20,000	20,000
Metal:[e]					
Primary	60,000	60,000	60,000	58,000	60,000
Secondary	53,000	52,500	52,000	[r]50,000	52,000
Total	113,000	112,500	112,000	[r]108,000	112,000
Cadmium metal, primary[e]	15	16	16	[3]16	16
Copper:					
Mine output, metal content	14,000	11,800	12,000	[e]13,000	12,000
Metal:					
Smelter, primary	18,000	16,000	16,000	17,000	16,000
Refined:[e]					
Primary	32,000	32,000	[r]34,000	32,000	32,000
Secondary	19,000	19,000	[r]20,000	19,000	19,000
Total	51,000	51,000	[r]54,000	[3]51,000	51,000
Iron and steel:					
Iron ore, gross weight marketable, 42% Fe[4] thousand tons	56	40	40	40	[3]40
Metal content of ore do	29	20	20	20	[3]18
Metal:					
Pig iron do	2,386	2,458	2,441	2,149	[3]2,196
Ferroalloys[e] do	155	150	150	150	150
Steel, crude do	7,023	7,308	7,467	7,169	[3]7,219
Semimanufactures (hot-rolled only) do	5,100	5,128	5,061	5,124	[3]5,426
Lead:					
Smelter, primary[e]	22,000	22,000	22,000	20,000	20,000
Refined, all sources	42,000	42,000	48,000	50,000	50,000
Nickel:					
Mine output, metal content, recoverable	2,500	2,700	2,700	2,500	2,200
Metal, refined	3,000	3,000	2,800	3,000	2,800
Silver, mine output, metal content, recoverable thousand troy ounces	1,550	1,510	1,450	1,450	1,450
Tin:					
Mine output, metal content, recoverable	1,600	1,800	1,600	1,700	1,700
Metal, smelter output	[r]1,600	[r]1,800	1,500	2,000	2,000
Zinc metal including secondary	17,000	[r]16,000	16,000	17,000	17,000
NONMETALS					
Barite[e]	35,000	35,000	35,000	35,000	35,000
Boron materials: Processed borax, $Na_2B_4O_7 \cdot 10H_2O$ content	4,200	3,400	4,300	[e]4,200	4,000
Cement, hydraulic thousand tons	12,273	12,440	12,204	11,721	12,000
Chalk[e] do	50	50	50	50	40
Clays, kaolin:[e]					
Crude do	380	400	400	420	400
Marketable do	190	200	200	210	200
Fluorspar[e] do	100	100	100	100	100
Gypsum and anhydrite:					
Crude[e] do	360	360	360	360	360
Calcined do	319	313	303	310	315
Lime and dead-burned dolomite do	3,470	3,401	3,441	3,510	3,500
Nitrogen: N content of ammonia do	1,078	1,182	1,205	1,170	1,200
Potash, marketable, K_2O equivalent do	3,395	3,422	3,460	3,434	3,500

See footnotes at end of table.

Table 1.—German Democratic Republic: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Pyrite, gross weight[e] thousand tons	25	25	25	[r]20	20
Salt:					
Marine do	55	52	56	55	55
Rock do	2,997	3,076	3,056	[e]3,060	3,070
Total do	3,052	3,128	3,112	3,115	3,125
Sodium compounds, n.e.s.:					
Caustic soda do	548	626	631	695	700
Sodium carbonate do	860	866	878	882	840
Sodium sulfate do	[e]127	124	128	142	140
Stone, sand and gravel:					
Crushed stone[e] do	15,000	15,000	15,500	15,000	16,000
Sand and gravel do	9,829	10,353	9,803	8,566	9,000
Sulfur:					
Byproduct:[e]					
Elemental do	80	80	80	90	90
Other forms do	270	270	270	270	290
From pyrite[e] do	10	10	10	--	--
Sulfuric acid do	952	958	948	920	940
MINERAL FUELS AND RELATED MATERIALS					
Coal, lignite do	256,063	258,097	266,734	276,038	280,000
Coke:					
From anthracite and bituminous coal do	[e]1,500	[e]1,500	1,391	1,226	1,200
From brown coal:					
High-temperature do	2,373	2,608	2,612	2,592	2,650
Low-temperature do	2,769	2,727	2,747	2,919	3,000
Total do	6,642	6,835	6,750	6,737	6,850
Fuel briquets (from lignite) do	48,698	49,693	49,803	50,005	[3]50,005
Gas:					
Manufactured million cubic feet	228,380	219,057	209,483	224,173	220,000
Natural, marketed production[e] do	302,450	302,450	301,000	[r]286,000	250,000
Petroleum:					
Crude thousand 42-gallon barrels	[r]444	[r]400	400	422	430
Refinery products:					
Gasoline do	27,832	28,333	29,257	33,071	33,500
Kerosine, jet fuel, distillate fuel oil do	[r]45,300	[r]46,503	42,665	46,679	47,000
Residual fuel oil do	59,000	59,300	56,610	58,000	59,000
Lubricants do	2,910	2,894	3,012	3,058	3,060
Total[5] do	[r]135,042	[r]137,030	131,544	140,808	142,560

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through Sept. 28, 1984.

[2] In addition to the commodities listed, magnesium, peat, and a variety of construction materials are produced, but output is not reported, and available information is inadequate to make estimates of output levels.

[3] Reported figure.

[4] Source indicates that data include "roasted ore."

[5] Total of listed products only; no estimates have been made for unreported products or refinery fuels and losses.

TRADE

The GDR's foreign trade turnover in 1983 increased by 12% to $60.2 billion, as it did the previous several years. Exports rose by 11.6% to $31.1 billion and imports by 12.4% to $29.1 billion. The GDR, nevertheless, still owed billions of dollars to Western banks and the U.S.S.R. The U.S.S.R. and other Council for Mutual Economic Assistance (CMEA) member countries again accounted for over two-thirds of the GDR's trade, and 198 economic, scientific, and technical agreements were in force with the U.S.S.R.

Although the GDR's trade balance has improved in the last 3 years, it was achieved through a domestic austerity program that included cutbacks in technology advances, lowered consumption levels, stagnation in the standard of living, and decreased investments, none of which improved the long-term prospects for economic growth.

Table 2.—German Democratic Republic: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982^{p}	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	--	44	--	Belgium-Luxembourg 42.
Ash and residue containing aluminum	--	279	--	All to Netherlands.
Metal including alloys:				
Scrap	4,059	11,545	--	Austria 4,852; Netherlands 3,014.
Unwrought	16,965	26,180	--	West Germany 23,209.
Semimanufactures	15,779	16,724	--	West Germany 10,808; Hungary 3,789.
Chromium: Oxides and hydroxides	--	26	--	Greece 15.
Copper: Metal including alloys:				
Scrap	1,805	560	--	Belgium-Luxembourg 540.
Unwrought	8,573	5,003	--	West Germany 4,488.
Semimanufactures	22,236	29,360	21	West Germany 28,834.
Gold: Metal including alloys, unwrought and partly wrought value, thousands	$50	$19	--	All to Sweden.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	--	141,609	--	Italy 135,275.
Metal:				
Scrap	22,030	20,050	--	West Germany 19,101.
Pig iron, cast iron, related materials	34,413	17,319	--	Austria 6,065; Netherlands 3,599.
Ferroalloys:				
Ferrochromium	--	2,114	--	West Germany 1,994.
Ferromanganese	NA	9,000	--	NA.
Ferromolybdenum	--	151	--	West Germany 110.
Ferrosilicon	336	7,281	--	West Germany 5,247.
Unspecified	9,034	1,689	--	Belgium-Luxembourg 1,552.
Steel, primary forms thousand tons	688	324	--	Italy 172; West Germany 144.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	876	1,105	--	Egypt 67; undetermined 835.
Universals, plates, sheets do	359	431	--	West Germany 62; France 36.
Hoop and strip do	393	392	(2)	West Germany 49; undetermined 337.
Rails and accessories do	14	14	--	NA.
Wire do	61	47	--	West Germany 5; undetermined 41.
Tubes, pipes, fittings do	185	172	--	Hungary 33; Poland 24.
Castings and forgings, rough do	99	73	--	West Germany 34; Poland 9.
Lead:				
Oxides	7,307	1,524	--	West Germany 529; Sweden 495.
Metal including alloys:				
Unwrought	250	1,950	--	All to Italy.
Semimanufactures	51	75	--	All to West Germany.
Magnesium: Metal including alloys:				
Unwrought	73	200	--	All to Belgium-Luxembourg.
Semimanufactures	(2)	17	--	All to West Germany.
Manganese: Ore and concentrate, metallurgical-grade	NA	3,000	--	NA.
Nickel: Metal including alloys, unwrought	11	66	--	Netherlands 59.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$315	$109	--	All to Netherlands.
Silver: Metal including alloys, unwrought and partly wrought do	$54,054	$83,658	--	United Kingdom $83,383.
Zinc: Metal including alloys, unwrought	1,886	1,885	--	United Kingdom 1,200.
Other:				
Oxides and hydroxides	335	2,032	--	Austria 1,913.
Ashes and residues	28,567	34,520	--	Austria 22,228; West Germany 12,286.
Base metals including alloys, all forms	425	6,201	(2)	West Germany 5,955.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	[3]263	306	--	Yugoslavia 112; Pakistan 70.
Asbestos, crude	--	2,710	--	All to West Germany.
Barite and witherite	3,168	40	--	All to Belgium-Luxembourg.
Boron: Oxides and acids	--	12	--	All to France.
Bromine	303	430	--	Hungary 276; West Germany 154.
Cement[4] thousand tons	1,252	1,291	--	West Germany 500; Hungary 98.
Chalk[5]	41,042	45,571	--	West Germany 9,833.

See footnotes at end of table.

Table 2.—German Democratic Republic: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Clays, crude:				
Kaolin[5]	115,883	146,062	--	West Germany 79,608; Netherlands 12,767.
Unspecified	23,194	45,684	--	West Germany 26,941; Yugoslavia 15,507.
Diamond:				
Gem, not set or strung value, thousands	$316	$2	--	All to Belgium-Luxembourg.
Industrial do	$274	$185	--	Do.
Feldspar, fluorspar, related materials	47,402	43,748	--	West Germany 14,229; Poland 9,884.
Fertilizer materials: Manufactured:				
Ammonia	24,870	8,329	--	West Germany 3,122; France 2,640.
Nitrogenous	795,336	974,226	11,057	West Germany 920,508.
Phosphatic	7,068	33,149	--	Bulgaria 22,000; Netherlands 8,900.
Potassic, K_2O content[5] thousand tons	2,860	2,834	25	Czechoslovakia 495; Brazil 426.
Unspecified and mixed	851	83,840	--	Malaysia 83,820.
Graphite, natural	51	103	--	Yugoslavia 100.
Gypsum and plaster[5]	103,009	101,758	--	Mainly to Sweden.
Lime	95,536	42,265	--	All to West Germany.
Magnesium compounds	--	76	--	All to Denmark.
Phosphates, crude	37,127	22,000	--	All to Bulgaria.
Pigments, mineral: Iron oxides and hydroxides, processed	348	399	--	Yugoslavia 244; Egypt 155.
Potassium salts, crude	98,501	97,203	--	West Germany 86,743.
Salt and brine[5] thousand tons	1,272	1,387	--	West Germany 151; Sweden 72.
Sodium compounds, n.e.s.:				
Carbonate, manufactured[5]	373,800	394,300	--	Czechoslovakia 70,000; Sweden 33,190.
Sulfate, manufactured	10,425	2,406	--	Sweden 1,528; Madagascar 774.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	19,312	438,816	--	West Germany 436,865.
Worked	26,875	67,647	--	West Germany 67,348.
Gravel and crushed rock[5]	222,392	511,880	--	NA.
Limestone other than dimension	11,367	4,163	--	All to West Germany.
Sand other than metal-bearing	51,715	41,506	--	Hungary 15,660; Austria 13,970.
Sand and gravel[5] thousand tons	2,388	2,114	--	All to West Germany.
Sulfur:				
Elemental:				
Crude including native and byproduct	--	748	--	All to Yugoslavia.
Colloidal, precipitated, sublimed	--	45	--	All to West Germany.
Sulfuric acid	[4]30,654	[5]30,345	--	Yugoslavia 18,058; West Germany 8,982.
Other:				
Crude	60,972	86,491	--	Denmark 39,374; Netherlands 17,272.
Slag and dross, not metal-bearing	67,687	35,652	--	Finland 32,996.
MINERAL FUELS AND RELATED MATERIALS				
Carbon:				
Carbon black	4,165	4,492	7	Czechoslovakia 1,142; United Kingdom 923.
Gas carbon	280	215	--	All to Hungary.
Coal:				
Anthracite and bituminous thousand tons	310	305	--	Poland 301.
Briquets of anthracite and bituminous coal do	526	490	--	Hungary 489.
Lignite including briquets[5] do	2,789	3,947	--	West Germany 1,886; Czechoslovakia 658.
Coke and semicoke	229,308	214,621	--	West Germany 177,305; Austria 23,026.
Gas, manufactured[5] million cubic feet	445	653	--	NA.
Peat including briquets and litter	262	1,467	--	West Germany 1,353.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	508	997	--	West Germany 612; Netherlands 324.
Gasoline[5] do	3,679	6,243	--	West Germany 2,869; Sweden 637.
Mineral jelly and wax do	79	105	17	West Germany 41; Netherlands 16.
Kerosine and jet fuel do	76	84	--	Hungary 82.
Distillate fuel oil[5] do	4,743	6,088	210	Mainly to West Germany.
Lubricants do	[4]76	[4]69	--	Mainly to Austria.
Nonlubricating oils do	4	7	--	All to West Germany.

See footnotes at end of table.

Table 2.—German Democratic Republic: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982^{p}	Destinations, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products —Continued				
Residual fuel oil[5] thousand 42-gallon barrels	18,322	14,399	--	West Germany 3,700; Norway 3,072.
Bitumen and other residues do	481	564	--	West Germany 563.

[p] Preliminary. NA Not available.

[1] Table prepared by Jozef Plachy. Owing to a lack of official trade data published by the German Democratic Republic (GDR), this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2] Less than 1/2 unit.

[3] Excludes unreported quantity valued at $324,000.

[4] Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

[5] Official Trade Statistics of the GDR.

Table 3.—German Democratic Republic: Apparent imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982^{p}	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate[2]	67,200	109,900	--	Hungary 106,838.
Oxides and hydroxides	98,869	100,171	1	West Germany 74,698; Hungary 25,267.
Metal including alloys:				
Scrap	372	109	--	Belgium-Luxembourg 84.
Unwrought	53,889	44,426	--	Yugoslavia 32,050; Hungary 7,347.
Semimanufactures	29,252	25,112	--	West Germany 11,983; Hungary 7,510.
Antimony: Metal including alloys, all forms	276	253	--	All from France.
Cadmium: Metal including alloys, all forms	--	252	--	Japan 208.
Chromium: Ore and concentrate, Cr_2O_3 content[2]	49,100	46,800	--	Mainly from U.S.S.R.
Cobalt: Metal including alloys, all forms	113	181	--	Finland 165.
Copper: Metal including alloys:				
Scrap	23,618	1,626	--	Switzerland 509; Netherlands 453.
Unwrought	40,981	36,649	--	West Germany 22,400.
Semimanufactures	5,090	5,220	--	France 2,278; Yugoslavia 1,314.
Gold:				
Waste and sweepings value, thousands	$32	$100	$100	
Metal including alloys, unwrought and partly wrought do	--	$781	--	All from West Germany.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite, Fe content[2] thousand tons	2,335	1,932	--	U.S.S.R. 1,550; India 369.
Metal:				
Scrap do	693	455	--	U.S.S.R. 235; West Germany 181.
Pig iron, cast iron, related materials do	664	871	--	West Germany 70; undetermined 801.
Ferroalloys:				
Silicon metal	196	102	--	All from Norway.
Unspecified thousand tons	74	78	--	NA.
Steel, primary forms do	2,312	2,320	--	West Germany 57; undetermined 2,260.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	683	771	--	U.S.S.R. 524; West Germany 97.

See footnotes at end of table.

Table 3.—German Democratic Republic: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982^p	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Semimanufactures —Continued				
Universals, plates, sheets thousand tons	742	816	--	U.S.S.R. 475; West Germany 248.
Hoop and strip do.	138	129	--	West Germany 35; undetermined 88.
Rails and accessories do.	239	189	--	NA.
Wire do.	28	26	--	West Germany 7; undetermined 15.
Tubes, pipes, fittings[3] do.	329	298	--	Czechoslovakia 28; West Germany 26; Poland 26.
Castings and forgings, rough do.	13	37	--	NA.
Lead:				
Oxides	29	8	--	West Germany 5.
Metal including alloys:				
Scrap	2,940	1,702	--	United Kingdom 784.
Unwrought	1,892	3,929	--	Yugoslavia 2,608; France 999.
Semimanufactures	--	156	--	Italy 155.
Manganese: Ore and concentrate, metallurgical-grade, Mn content[2]	46,000	39,800	--	Mainly from U.S.S.R.
Mercury 76-pound flasks	841	1,363	--	All from West Germany.
Molybdenum: Ore and concentrate	340	425	--	All from Finland.
Nickel: Metal including alloys:				
Unwrought	80	198	--	Finland 196.
Semimanufactures	110	134	--	West Germany 129.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$2,097	$905	--	West Germany $865.
Silver: Metal including alloys, unwrought and partly wrought do.	$95,114	$111,905	$1	West Germany $111,892.
Tin: Metal including alloys, unwrought	69	143	--	All from West Germany.
Titanium:				
Ore and concentrate	778	1,297	--	All from Netherlands.
Oxides	20,419	18,856	--	Yugoslavia 11,388; West Germany 3,880.
Tungsten: Ore and concentrate	38	130	--	Netherlands 95.
Uranium and/or thorium: Metal including alloys, all forms	(4)	11	--	All from France.
Zinc:				
Ore and concentrate	49,728	63,648	10,324	West Germany 51,324.
Oxides	170	109	--	West Germany 59; France 32.
Blue powder	--	258	--	All from West Germany.
Metal including alloys:				
Scrap	1,061	504	--	Denmark 363.
Unwrought	1,375	28,011	--	West Germany 12,861; Yugoslavia 6,675.
Semimanufactures	2,448	1,559	--	West Germany 1,004; Poland 211.
Other:				
Ores and concentrates	5,597	5,144	--	All from Norway.
Oxides and hydroxides	18,788	6,983	--	Austria 5,565.
Ashes and residues	244	6,470	--	West Germany 5,703.
Base metals including alloys, all forms	14,264	25,090	--	West Germany 24,942.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	49	140	--	All from France.
Artificial: Corundum	4,007	3,934	--	West Germany 3,914.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$130	$69	--	Netherlands $59.
Grinding and polishing wheels and stones	[5]294	113	--	Austria 52; France 32.
Asbestos, crude[2]	50,200	61,200	--	NA.
Barite and witherite	1,291	667	--	All from West Germany.
Boron materials:				
Crude natural borates	3,240	15,408	--	West Germany 10,046.
Oxides and acids	5,489	4,965	--	France 4,809.
Cement[3]	41,900	7,300	--	West Germany 6,253.
Chalk	214	171	--	All from France.
Clays, crude:				
Bentonite	11,409	10,539	--	Hungary 10,324.
Chamotte earth	--	519	--	All from France.
Unspecified	587	7,066	--	Czechoslovakia 3,000; United Kingdom 2,573
Diamond:				
Gem, not set or strung value, thousands	$13	$200	--	All from Belgium-Luxembourg.
Industrial do.	$3,485	$709	--	Belgium-Luxembourg $648.
Diatomite and other infusorial earth	1,395	857	--	West Germany 638.

See footnotes at end of table.

Table 3.—German Democratic Republic: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982^p	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Feldspar, fluorspar, related materials	41,991	14,748	--	Norway 9,498; Sweden 5,200.
Fertilizer materials: Manufactured:				
Nitrogenous, N_2 content[3]	15,000	69,400	--	West Germany 14,429.
Phosphatic, P_2O_5 content[2]	25,800	21,200	--	All from West Germany.
Unspecified and mixed	25,024	105,500	--	All from Austria.
Graphite, natural[2]	6,795	7,945	--	Austria 974; West Germany 893.
Gypsum and plaster	144	174	--	France 155.
Lime	--	98	--	All from Belgium-Luxembourg.
Magnesium compounds:				
Magnesite	34,741	36,084	--	All from Czechoslovakia.
Other	2,077	1,271	--	Greece 700.
Mica, all forms[2]	1,224	1,616	--	India 985.
Phosphates, crude, P_2O_5 content[2] thousand tons	416	420	4	U.S.S.R. 416.
Pigments, mineral:				
Natural, crude	63	46	--	All from Austria.
Iron oxides and hydroxides, processed	40	2	--	Yugoslavia 1.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$21	$148	--	All from West Germany.
Synthetic do.	$26	$44	--	Austria $41.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	8,306	5,188	--	Hungary 3,256; Yugoslavia 1,353.
Worked	504	1,208	--	Portugal 778.
Gravel and crushed rock	667	326	--	Yugoslavia 240.
Quartz and quartzite	11,294	11,875	--	West Germany 11,841.
Sand other than metal-bearing	3,222	499	--	France 238; Netherlands 212.
Sulfur:				
Elemental: Crude including native and byproduct	167,000	337,900	--	All from Poland.
Dioxide	700	9,412	--	All from West Germany.
Sulfuric acid	[3]9,400	808	--	West Germany 807.
Talc, steatite, soapstone, pyrophyllite	3,372	5,222	--	Finland 1,955; West Germany 1,410.
Vermiculite	--	146	--	All from West Germany.
Other:				
Crude	30,147	27,206	--	Hungary 27,061.
Slag and dross, not metal-bearing	50	1,632	--	Netherlands 1,241.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	42	39	--	All from Yugoslavia.
Carbon: Carbon black	42,610	37,738	--	U.S.S.R. 22,258; West Germany 13,625.
Coal:				
Anthracite and bituminous[2] thousand tons	5,361	4,739	--	U.S.S.R. 2,897; Poland 1,085.
Lignite including briquets do.	1,146	3,600	--	Czechoslovakia 2,662; Poland 938.
Coke and semicoke[2] do.	2,438	2,022	--	U.S.S.R. 1,055; Czechoslovakia 589.
Gas, natural: Gaseous[2] million cubic feet	221,247	225,731	--	All from U.S.S.R.
Peat including briquets and litter	528	570	--	All from West Germany.
Petroleum:				
Crude[2] thousand 42-gallon barrels	167,059	158,739	--	Mainly from U.S.S.R.
Refinery products:				
Gasoline do.	279	6	--	Netherlands 3.
Kerosine and jet fuel do.	35	58	--	Hungary 42.
Distillate fuel oil do.	138	2	--	Italy 1.
Lubricants[3] do.	144	117	--	NA.
Nonlubricating oils do.	9	1	--	All from West Germany.
Residual fuel oil[3] do.	159	141	--	NA.
Petroleum coke do.	124	116	--	All from West Germany.
Unspecified[3] do.	2,170	582	--	Mainly from U.S.S.R.

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^pPreliminary. NA Not available.

[1] Table prepared by Jozef Plachy. Owing to a lack of official trade data published by the German Democratic Republic (GDR), this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2] Official Trade Statistics of the GDR.

[3] Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

[4] 1981 imports valued at $13,000.

[5] Excludes imports valued at $643,000.

COMMODITY REVIEW

METALS

Because of the rapid depletion of indigenous resources and the paucity of natural metallic raw materials, the recovery and reuse of scrap materials continued to be an important aspect of the GDR's metallurgical industry. Recovered materials accounted for about 11.5%, or 27 million tons, of all requirements for industrial raw materials. There were more than 1,600 collection stations for waste materials, in addition to scrap collected by the combines. The country, however, has experienced scrap shortages, as shown in the following, in thousand metric tons:[4]

Commodity	1981	1982
Steel scrap	6,339	[1]5,982
Aluminum and alloy scrap	56	63
Copper and alloy scrap	54	48
Lead and alloy scrap	44	41
Zinc and alloy scrap	18	20

[1] Metal content.

The shortage of raw materials and the high cost of imports prompted the Government to step up the collection and extraction of metals from scrap. For example, an experimental plant was in operation in the Karl-Marx-Stadt area for the recycling of old household appliances for copper, iron, lead, silver, and zinc. A large recycling plant was being constructed in East Berlin.

Iron and Steel.—For all practical purposes, the production of iron ore from domestic mines had almost ceased. The production of pig iron and crude steel stagnated for the past 2 years, and imports remained at a record high. In 1983, the GDR was in 18th place worldwide in the output of raw steel, behind Belgium and just overtaking the Republic of South Africa. The annual raw steel production capacity was about 7.5 million tons, and that of pig iron and blast furnace alloys totaled 2.5 million tons per year. The only major changes envisaged for the future were the improvement of the quality of the products and improvement in reprocessing technology and production efficiency.

About 125,000 workers were employed by the iron and steel industry. About 49% of all steel produced was used by the motor vehicle industry, and 22% by construction industries.

The GDR's steel industry relied heavily on imports of iron and manganese ores, and of coke. Over 68% of iron ore, 32% of ferroalloys, and 100% of manganese ore came from the U.S.S.R. The GDR also imported from the U.S.S.R. 28% of its demand for steel pipes; other imported products included hot coil, heavy plates, and rolled steel.

Steel continued to be produced in open-hearth furnaces, although oil firing was slowly replacing gas while the use of the widely available noncoking coal was actively pursued. The proportion of electric-furnace steel was also increasing as was progress on the planned installation of 2,000 industrial robots in the steel industry by 1985.[5] Almost 61% of steel was produced by the open-hearth process, 29% by electric arc and plasma furnaces, and 10% by the converter processes. The open-hearth process was used almost exclusively for the reprocessing of scrap, which made up 70% of the charge, the rest being pig iron. The basic oxygen process was planned to be first used in the GDR in 1985, with production of 2.3 million tons.

The GDR had built up its iron and steel industry over the past 35 years, with production currently in excess of 2 million tons per year. In the past several years, there has been acceleration in expansion and modernization, and the 1981-85 5-year plan provided for increases in production, with the introduction of LD converters, and increases in continuous casting and rolling capacity. A considerable portion of the new equipment was supplied by market economy countries.

Reportedly, the VEB Edelstahlwerke "8 Mai 1945" at Freital, which previously developed plasma and electron furnace beam melting processes, was in 1983 introducing ladle metallurgy. The intent was to produce 240,000 tons of steel per year with two electric furnaces, which was previously accomplished with three. The largest plasma furnace in the world at 30,000 tons per year capacity was located at Freital.

VEB Stahl-und Walzwerk "Wilhelm Florin" at Henningsdorf was undergoing expansion and employed about 9,000 workers. The steelworks, which is part of the Henningsdorf steel complex, awarded a $13 million contract to Krupp Stahl AG of the Federal Republic of Germany for the modernization of its three electric arc furnaces and to supply certain equipment for the melting shops and the rolling mill, including emission control equipment. During the year, Krupp had reportedly already converted the No. 2 melting shop and the rolling mill ahead of schedule, thus raising its output by 20%. Krupp had also supplied a new electric arc furnace to the plant in 1976.

One of the largest metallurgical complexes, VEB Eisenhüttenkombinat "Ost" at Eisenhüttenstadt, was under expansion and was to become operational in 1984. The production of continuous castings was anticipated to reach 2 million tons by that time. In 1983, the plant produced almost 75% of the country's pig iron and employed a total of 1,600 to 2,500 employees.

NONMETALS

The resources and reserves of nonmetals were more plentiful than those of metals. As previously, the GDR continued to successfully exploit its barite, chalk, fluorite, gypsum, potash, and salt deposits. The production of industrial and building materials was also well developed, although little of it was exported. Many of the quarries were small but widely scattered, with very little fluctuations in annual production, which accounted for steady and reliable local employment. Many of the industrial minerals were processed as part of the larger coal mining operations.

Potash production by the only state-owned company, VEB Kombinat Kali, reached an alltime high of 3.5 million tons of K_2O equivalent in 1983, virtually the production capacity of the country. The potash producing region stretched from Magdeburg Province in the north to Suhl Province in the south, bordering the Federal Republic of Germany.

The potash industry was the largest exporter in the GDR, employing about 32,000 workers. Exports were almost at the same level as in 1982, or 82% of all production; 41% of it going to other CMEA countries and 25% going to Western Europe, mostly to the United Kingdom. The imports of potash by CMEA countries were declining, except for Hungary, which imported 34% more potash from the GDR, at 154,000 tons of K_2O equivalent. In South America, the GDR continued to occupy a very strong position, with potash sales to Brazil rising from 372,000 tons K_2O equivalent in 1982 to 413,000 tons in 1983. A dramatic increase from 4,000 tons in 1982 to 53,000 tons in 1983 in Colombia, combined with those by Brazil and other South American countries, gave a total for the area of 472,000 tons K_2O equivalent in 1983. However, exports to Morocco and Asia were reduced by 10% and 15%, respectively.

Potassium chloride was mined from 11 mines by VEB Kombinat Kali as potash. The production of 5.7 million tons in 1983 was 98% of the capacity of 5.8 million tons, thus remaining stable for the last several years. Western Europe was the largest importer of the GDR's potassium chloride in 1983, at 1.9 million tons, followed by Asia at 1.1 million tons. U.S. imports of potassium chloride for consumption jumped from about 9,100 tons in 1977 to 122,500 tons in 1983, accounting for about 3% of all GDR exports.

MINERAL FUELS

Lignite was the only significant domestically produced mineral fuel, with only negligible quantities of oil and gas produced. Electricity was generated primarily from coal, 82.3%, and about 10.5% from nuclear power. Most power, however, was imported. The installed capacity of electrical power stations in the GDR increased from 14,940 megawatts in 1973 to almost 23,500 megawatts in 1983. Sources of domestically produced electrical energy for 1981-82 are summarized in the following tabulation:

Sources of electrical power	Million kilowatt hours	
	1981	1982
Brown coal and lignite	79,910	83,849
Nuclear fuel	11,902	10,849
Hydroelectric plants	1,736	1,766
Liquid fuels (petroleum)	926	703
Brown coal briquets	523	491
Hard coal	285	321
Other	5,438	4,927
Total	100,720	102,906

The energy situation deteriorated slightly in 1983, owing primarily to the increasing unit costs and reductions in the volume of Soviet oil deliveries. The country was thus forced to rely more heavily on domestic lignite in the short term and on nuclear power as a substitute for lignite in the long term. A comparison of the 1976-80 5-year plan with the 1981-85 plan indicates a planned increase for coal production from 258 million tons in 1980 to 295 million tons in 1985. Until the early 1970's, the GDR substituted oil and natural gas from the U.S.S.R. for domestic lignite, a process that reversed after the rise in Soviet energy prices and the limitation on deliveries.

Coal.—The GDR's lignite industry, the largest in the world, accounted for about 26% of world production.[6] Recoverable lignite reserves were estimated at between 25 to 40 billion tons, translating into 50 years of production. The Cottbus area was the largest lignite mining district in 1983, with VEB Braunkohlen-Kombinat Senftenberg producing 63% of the country's lignite with 50,000 workers. The Senftenberg Combine operated 13 of the 30 to 34 lignite mines. The second largest lignite mining district was around the Leipzig area, about 75 miles west of Cottbus. In 1982, 54 million tons, or 20% of the 276 million tons of total lignite, was mined there, including the production of 34% of briquets. The 9 surface mines in the area employed up to 2,000 workers, supplying large power and chemical plants such as those at Bohlen and Espenhain, and partly supplying Launa and Buna in the Hale area to the northwest. The city of Leipzig depended mainly on lignite, and even the city's rail terminal is underlaid by lignite seams. The extensive surface mining activity was visible all around Leipzig and virtually destroyed the Pleisse River, which included the relocation of highways and villages, similar to what previously happened to the railway line between Zeitz and Leipzig and the Weisse Elster River, for which a converter channel was built to contain it. In addition, the numerous coal-burning plants worried the GDR's neighbors—per capita, the GDR discharged more sulfur into the atmosphere than any other country in Europe. Between 1960 and 1982, about 135,000 acres were disturbed by surface mining, 108,000 of which were supposedly reclaimed.

Coal mining also became more difficult and expensive, in that 4 cubic meters of overburden had to be stripped, moved out, and redistributed for every ton of lignite mined. As the surface pits were mined deeper, ground water and equipment problems added to the ever rising costs of lignite production.[7] On the average, 32 million cubic meters of overburden was removed for each 9 million tons of coal mined.

The consumption of lignite by thermal powerplants again rose and accounted for 71% of total energy requirements. The GDR consumed about 39% of the city gas produced from lignite. The GDR also consumed about 5 million tons of anthracite, all of which has been imported since 1978.

Reportedly, new lignite surface mines were developed, such as at Bockwitz and Dreiweibern, to be put into production by 1985. The Spreetal Nordost surface mine of the Welzow Lignite Combine began operation in 1983, with all production going to the Schwarze Pumpe Gas Kombinat. The mine was reportedly equipped with 11 robots operating the excavators and stackers that mined 20,000 tons of coal per day. The surface mine at Dreiweibern also became operational in 1983. Between 1970 and 1983, 17 surface pits were mined out, while 13 new ones were opened during the same period, such as in Delitzsch Southwest, Nachterstedt, Mersceburg East, Profen South, Groitzscher Dreieck, Peres, Schlabendorf South, Janschwalde, Cottbus North, Nochten, Baerwalde, Cospuden, and Spreetal Northeast.

The surface mines, briquet plants, and thermal powerplants employed more than 111,000 workers in 1983, working continuously in three shifts. More than 25% of all employees were women, 8% of which were in management positions.

The production of fuel briquets remained more or less constant for a number of years, being an important part of the GDR's lignite industry. In 1983, the 80-year old Welzo briquet plant of the Cottbus District was being extensively renovated.

The accelerated lignite mining also affected the chemical industry, and the Government was implementing research projects to fully utilize the abundant resources. The plant at Böhlen put 150 scientists to work on lignite gasification, liquefaction, and chemical processing; the liquefaction plant was to become operational by 1992. In addition to the various chemicals produced as a bypoduct of lignite mining, other secondary raw materials were also obtained, such as about 2.2 million tons of clay, 2.4 million tons of gravel, 400 to 500 million cubic meters of water, 110,000 cubic meters of foundry sand, and about 47,000 cubic meters of kaolin.[8]

Natural Gas and Petroleum.—The domestic production of crude oil and gas was negligible, and the GDR has traditionally depended on the U.S.S.R. for imports. Exploration in the northern part of the country continued in the Baltic Sea, undertaken by the GDR jointly with Poland and the Soviet Union.

In the past, oil imports from the U.S.S.R. accounted for almost 90% of the GDR's demand, with the remainder purchased on the world market, but in 1980, the Soviet

Union froze oil exports to all CMEA countries, the GDR's limit being 140 million barrels. In 1981, the U.S.S.R. again cut its deliveries by 10% to CMEA, limiting GDR to 126 million barrels annually during 1982 and 1983. The GDR was the largest importer of Soviet oil, all of it going to the petrochemical combine at Schwedt.

The GDR signed an agreement with Finland calling for that nation to refine 1.5 million barrels of the GDR's domestic and imported crude oil in 1983.

Almost 80% of crude was refined at the VEB Schwedt Petrochemical Kombinat, which also produced one-third of all the GDR's chemical products. Output included 62% of all gasoline, 48% of diesel fuel, 73% of liquefied petroleum gas, 27% of bitumen, and 15% of nitrogen fertilizer. The combine, including the oil refinery, was approved in 1958 and built in 1970 for the processing of Soviet crude oil. The combine employed about 30,000 workers in 1983 and had a refining capacity of between 160 to 180 million barrels per year. About 53% of the employees were involved in the actual production work.

VEB Leunawerke "Walter Ulbrecht" was the only other refinery; it also produced synthetic gas. The gas plant at Leuna was built in 1927, based on the Winkler process, and used lignite low-temperature coking coal. In 1983, plans were made to reconstruct it, so that by 1985 it is to consume 100,000 tons more coal than it does at present for the production of methanol and ammonia.

The production of natural gas in the GDR remained at about 250,000 million cubic feet in 1983, but was declining owing to meager reserves. Proven gas reserves accounted for only 0.1% of world reserves, or 2,295 billion cubic feet, representing less than 8 years of additional production.

Nuclear Energy.—Nuclear fuel was the second largest source, after coal, for the generation of electrical power. There were five operational blocks with a total capacity of 1,760 megawatts. Another six blocks, at 5,680 megawatts capacity, were under construction and two more blocks at 2,000 megawatts were in the planning stages. The industry relied heavily on the U.S.S.R. for nuclear fuel, reactors, plant assembly, and other assistance. In view of the high-cost difficulties of lignite mining, the development of atomic energy was again in the forefront of the GDR's energy plans.

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[1] Physical scientist, Division of Foreign Data.

[2] The German Democratic Republic's mark (M) is not convertible, and the official exchange rate cannot be used as a measure of relative value. Foreign trade figures, however, are denoted in valuta mark (VM). The rate of valuta mark converted to U.S. dollars in 1983 was taken as VM2.70=US$1.00.

[3] Press-Informationen. No. 81, July 13, 1984, p. 4.

[4] Hauk, P. German Democratic Republic. Min. Ann. Rev., 1984, pp. 481-483.

[5] Metal Bulletin Monthly. East German Steel. Aug. 1983, pp. 59-65.

[6] Tilmann, W. Der Braunkohlenbergbau in der DDR. Braunkohle 35, No. 12, Dec. 1983, pp. 362-368.

[7] Press-Informationen. No. 126, Oct. 28, 1983, pp. 2-3.

[8] ———. No. 31, Mar. 13, 1984, pp. 5-6.

The Mineral Industry of the Federal Republic of Germany

By George A. Rabchevsky[1]

The Federal Republic of Germany (FRG) was a significant producer of steel and the processor of selected nonferrous metals, potash, and coal. The iron and steel industry played an important role in the domestic sectors of the country's economy. Except for lead and zinc ore, and coal, the mining industry of the FRG was declining.

After more than 2 years of economic downswing, the most severe recession in the history of the FRG, a process of recovery started in 1983. In view of the poor economic performance, the FRG in December 1982 passed an almost zero-growth budget of 1.5% increase in real gross national product (GNP) for 1983. The proposed budget also envisaged a continued rise in unemployment, taxes, prices, expenditures, and loans. The minerals industry was also not expected to grow, except that the 7.3% increase in the research budget to $2.63 billion[2] included a $1 billion increase in the energy sector, the largest of all other research categories. The only favorable forecast was in the expected sharp deceleration in inflation.

Although the predicted stagnation did materialize in 1983 to some extent, the economy actually picked up slightly in some sectors at yearend. Real economic growth was 1.3%, the GNP rose by 3.2%, and inflation rose to over 3%. The number of unemployed rose to 2.5 million, which included a sizable portion from the mineral industry. The steel regions, Lower Saxony, North Rhine-Westphalia, and the Saarland coal areas were hardest hit, at 10% to 12% unemployment.

Although private consumption demand led the slow recovery, troubles in steel, coal, and shipbuilding industries kept subsidies trending upwards. Federal subsidies amounted to $10.6 billion, one-third of it going to industry. The coal mining industry's subsidy was $481.5 million, and the steel industry was promised $1.1 billion for the 1984-85 period for capacity reduction and reconstruction.[3]

Many of the metals-producing companies showed a gain in 1983. Metallgesellschaft AG, for example, ended the year with sales of $3.6 billion, just slightly ahead of that of 1982. Sales by its Raw Materials Div., mostly nonferrous metals, rose by 12%. The largest increases were in sales of aluminum, zinc, and copper. Demand for lead remained weak, partly because of increasingly stringent environmental regulations. Most of the Raw Material Div.'s domestic mines had a successful year; their output was as follows, in metric tons:[4]

Material	1982	1983
Barite:		
Concentrate	63,525	63,988
Ground	87,880	85,674
Fluorspar, concentrate	30,641	31,178
Metal ores	743,756	861,724
Lead, concentrate	10,038	6,151
Pyrite, concentrate	438,195	501,282
Zinc, concentrate	99,169	97,399

Degussa AG, a multifaceted metals production and trading company, reported a healthy 25% increase in its sales at $4 billion. The largest increase came from its metals sales, especially precious metals.[5]

Mannesmann AG, on the other hand, experienced a sharp drop in profits to $40 million, from $72 million in 1982. The company's sales abroad dropped 15%, as did its steel tube and pipe turnover, resulting from a general fall in prices and a worldwide drop in demand.

At its annual conference in October, IG

Metall, the largest trade union in the FRG with 3.7 million members, of which 2.5 million were metal workers, began a campaign for a 35-hour workweek. The union claimed that a cut to a 35-hour week in the metal industry alone would create 250,000 jobs and if extended throughout the economy would create as many as 1.2 million jobs. The employers, on the other hand, argued that a 35-hour week would increase industry's costs by 18% at a time when it was barely emerging from the recession and struggling to regain export markets.

PRODUCTION

Production of iron and steel continued to decline, although production of semimanufactures in 1983 increased over that of 1982. Production and consumption of all nonferrous metals increased in varying degrees. The greatest rise was recorded by the zinc smelters, after a decline in 1982. Aluminum smelters continued to operate at 95% capacity; Vereinigte Aluminium Werke AG (VAW) possessed over 45% of total output capacity. Refined copper production also continued an upward climb since 1980. The production of nonmetals was more erratic, with only potash showing a significant increase in 1983. All forms of mineral fuels, except natural gas, suffered production losses.

Table 1.—Federal Republic of Germany: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum:					
Bauxite, gross weight	349	264	79	494	200
Alumina thousand tons	1,539	1,608	1,651	1,510	[2]1,580
Metal:					
Primary do.	741	731	729	723	[2]743
Secondary:					
Alloyed do.	381	368	360	364	[2]385
Unalloyed do.	45	40	41	45	[2]41
Cadmium metal, smelter	1,266	[r]1,194	1,192	1,030	1,095
Cobalt metal, smelter[e]	385	[r]300	[r]151	[r]150	100
Copper:					
Mine output, metal content	861	1,274	1,429	1,303	21,209
Metal:					
Blister and anodes:					
Primary	158,200	153,900	163,100	161,800	162,000
Secondary	92,500	103,900	88,300	78,200	78,300
Total	250,700	257,800	251,400	240,000	240,300
Refined including secondary:					
Electrolytic	303,122	302,516	304,068	313,664	[2]332,846
Fired refined	79,396	71,483	83,370	80,408	[2]87,927
Total	382,518	373,999	387,438	394,072	[2]420,773
Gold:					
Mine output, metal content troy ounces	2,357	2,964	3,051	1,813	1,900
Metal including secondary do.	293,857	298,873	298,873	299,000	300,000
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	1,649	1,948	1,575	1,314	[2]979
Iron content do.	526	597	477	387	[2]280
Metal:					
Pig iron do.	35,167	33,873	31,876	27,621	[2]26,598
Blast furnace ferromanganese, spiegeleisen, ferrosilicon do.	312	264	264	242	[2]174
Electric-furnace ferroalloys do.	195	182	154	131	[2]119
Steel, crude do.	46,040	43,838	41,610	35,880	[2]35,799
Semimanufactures do.	32,813	31,661	30,850	25,782	[2]26,061

See footnotes at end of table.

Table 1.—Federal Republic of Germany: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
METALS —Continued					
Lead:					
Mine output, metal content	25,223	23,063	21,605	23,455	[2]23,523
Metal:					
Smelter:					
Primary	103,374	111,891	107,493	110,749	[2]116,216
Secondary	213,186	189,458	254,824	239,746	[2]232,961
Total	316,560	301,349	362,317	350,495	[2]349,177
Refined:					
Primary	194,800	191,100	189,500	190,300	[2]212,500
Secondary	178,500	159,200	158,800	148,900	[2]140,000
Total	373,300	350,300	348,300	339,200	[2]352,500
Mercury (secondary only) 76-pound flasks	2,639	1,624	2,205	1,537	2,000
Nickel metal including secondary[3]	1,223	1,235	[e]1,200	1,200	1,200
Platinum[e] troy ounces	2,400	2,411	2,411	2,420	2,450
Silver:					
Mine output, metal content thousand troy ounces	1,039	1,058	1,126	1,279	1,280
Metal including secondary do.	16,291	24,371	21,126	21,000	21,000
Tin metal including secondary	4,096	2,262	1,815	608	500
Zinc:					
Mine output:					
Metal content	117,100	120,800	110,700	105,800	[2]113,900
Metal content, recoverable	96,853	99,720	91,779	86,920	[2]92,562
Metal, unwrought, unalloyed:					
Primary	333,665	342,797	331,471	303,373	[2]328,689
Secondary	21,858	27,849	35,085	31,578	[2]27,848
Total	355,523	370,646	366,556	334,951	[2]356,537
NONMETALS					
Abrasives: Artificial: Corundum	102,212	102,222	97,026	80,385	[2]74,201
Barite	161,661	175,380	165,189	165,661	[2]163,851
Bromine	4,020	4,006	3,567	3,073	[2]3,136
Cement and clinker:					
Cement excluding clinker thousand tons	35,287	[r]34,186	31,498	30,078	[2]30,466
Clinker do.	1,377	1,360	1,364	959	702
Clays:					
Fire clay excluding klebsand do.	5,635	5,791	5,478	5,594	5,540
Kaolin, marketable do.	556	502	475	454	490
Bleaching do.	639	638	625	700	650
Other (schieferton) do.	124	152	131	86	100
Diatomite and similar earth, marketable	43,271	52,824	42,373	42,695	42,500
Feldspar, marketable	372,754	380,880	342,148	331,430	[2]330,000
Fluorspar, marketable:					
Acid-grade[e]	56,855	70,337	64,627	64,800	72,000
Metallurgical-grade[e]	6,317	7,815	7,181	[r]13,839	8,000
Total	63,172	78,152	71,808	78,639	[2]80,000
Graphite:					
Crude	7,342	11,375	16,372	23,305	23,500
Marketable[e]	3,671	5,688	8,186	[r]11,653	[2]10,000
Gypsum and anhydrite, marketable thousand tons	2,251	2,250	1,952	1,721	[2]1,720
Lime (hydrated), quicklime, dead-burned dolomite do.	9,238	[r]8,576	7,916	6,898	[2]6,871
Nitrogen: N content of ammonia do.	2,161	2,044	1,962	1,570	[2]1,703
Phosphates:					
Thomas slag-based fertilizer, P_2O_5 content do.	145	161	138	130	110
Pigments, mineral, natural	[r]16,639	24,669	22,524	18,589	20,000

See footnotes at end of table.

Table 1.—Federal Republic of Germany: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Potash, K_2O equivalent:					
Crude, marketable ______ thousand tons__	74	76	72	75	[2]87
Chemically processed __________do____	2,542	2,661	2,519	1,981	[2]2,332
Total __________________do____	2,616	2,737	2,591	2,056	[2]2,419
Pumice:					
Crude and washed ____________do____	2,640	2,102	1,253	745	[2]645
Marketable ________________do____	1,432	807	399	[r][e]220	[2]200
Pyrites, marketable concentrate, gross weight do____	460	502	483	508	500
Quartz, quartzite, glass sand:					
Quartzite __________________do____	426	454	395	326	[2]331
Quartz sand, ground____________do____	454	453	422	378	[2]337
Quartz sand, unground and glass sand do____	7,417	7,475	7,018	7,320	[2]7,391
Salt, marketable:					
Rock _____________________do____	8,960	6,759	8,367	7,034	7,000
Marine and other ____________do____	6,130	4,637	4,174	3,944	3,500
Sodium compounds:					
Sodium carbonate ____________do____	1,401	1,411	1,189	1,105	[2]1,218
Sodium sulfate ______________do____	211	225	255	214	[2]125
Stone, sand and gravel, n.e.s.:					
Dimension stone ___thousand cubic meters__	311	264	324	254	[2]237
Limestone, industrial _____ thousand tons__	54,521	53,477	49,243	42,935	[2]44,371
Crushed and broken stone ________do____	126,463	117,616	99,149	93,286	[2]91,445
Slate _____________________do____	[r]45	[r]50	52	53	[2]62
Basalt lava and lava sand ________do____	8,056	8,153	7,784	7,010	[2]6,350
Calcite ____________________do____	8	5	3	3	3
Grinding stone __________ cubic meters__	71	43	[e]42	40	40
Sand and gravel ________ thousand tons__	198,637	188,155	164,437	150,016	[2]146,414
Sulfur:					
S content of pyrites ____________do____	203	222	213	229	200
Byproduct:					
Of metallurgy ______________do____	450	450	[e]400	400	400
Of natural gas______________do____	690	814	834	872	650
Of petroleum ______________do____	213	220	[r][e]190	[r][e]220	195
Unspecified[e]______________do____	93	93	95	100	95
Total ________________do____	1,649	1,799	1,732	1,821	1,540
Talc including talc schist __________do____	15	15	15	15	15
MINERAL FUELS AND RELATED MATERIALS					
Carbon: Carbon black __________________	340,629	353,568	354,191	348,037	[2]362,125
Coal:					
Anthracite ___________ thousand tons__	7,018	87,146	88,460	89,014	[2]82,202
Bituminous __________________do____	79,301				
Lignite____________________do____	130,579	129,833	130,619	127,307	[2]124,281
Total __________________do____	216,898	216,979	219,079	216,321	[2]206,483
Coke, metallurgical _____________do____	26,501	28,494	27,914	26,275	[2]22,427
Fuel briquets:					
Of anthracite and bituminous coal ___do____	1,673	1,455	1,332	1,285	[2]1,244
Of lignite __________________do____	4,752	4,446	4,169	3,951	[2]3,568
Gas:					
Manufactured (excluding that from petroleum refineries):					
Blast furnace _____ million cubic feet__	212,629	199,456	185,752	153,545	[2]147,683
Coke oven _______________do____	214,324	226,336	227,246	214,144	[2]185,856
Other[e] _________________do____	52,760	53,000	53,000	[r]52,000	51,000
Total ________________do____	479,713	[e]478,792	[e]465,998	419,689	384,539
Natural: Gross _______ million cubic feet__	743,900	658,430	673,014	568,909	[2]622,339
Peat:					
Agricultural use ________ thousand tons__	1,849	1,555	1,742	1,842	[2]1,868
Fuel use ____________________do____	230	279	246	253	[2]259

See footnotes at end of table.

Table 1.—Federal Republic of Germany: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum:					
Crude ______ thousand 42-gallon barrels__	34,482	33,450	32,207	30,734	[2]29,730
Refinery products:					
Gasoline, motor ____________do____	182,800	182,296	167,731	171,599	[2]170,885
Jet fuel (including aviation gasoline) do____	10,345	10,506	11,802	11,099	[2]11,231
Kerosine ________________do____	523	315	349	636	[2]605
Distillate fuel oil ___________do____	345,621	311,192	270,977	264,823	[2]252,029
Residual fuel oil ___________do____	146,333	128,509	143,037	127,852	[2]104,649
Lubricants _______________do____	[r]10,576	[r]9,922	9,874	9,229	[2]8,687
Liquefied petroleum gas _______do____	36,669	30,938	26,425	26,262	[2]23,942
Bitumen ________________do____	[r]23,748	20,406	18,470	17,676	[2]19,460
Unspecified _______________do____	[r]137,882	[r]122,646	47,304	38,205	45,809
Refinery fuel and losses _______do____	[r]58,863	[r]57,827	55,762	52,255	[2]50,169
Total _______________do____	953,360	874,557	751,731	719,636	[2]687,466

[e]Estimated. [p]Preliminary. [r]Revised.

[1] Table includes data available through June 1984.

[2] Reported figure.

[3] Primary nickel and nickel contained in ferronickel, Monel metal, and nickel oxide directly used by the steel industry.

TRADE

Exports pulled the West German economy out of the doldrums in 1983, accounting for about 30% of GNP and contributing about $3.7 million to the foreign trade surplus account. The biggest increase was in sales to the United States, followed by the European Economic Community (EEC) countries. The export of basic and consumer goods and increased domestic consumption were credited with the surplus.

The FRG was the Soviet Union's biggest trading partner, exporting to the Soviet Union finished goods and importing mineral fuels and other raw materials. In 1982, FRG exports to the U.S.S.R. grew 16% in real terms, significantly faster than total FRG exports, which grew 8%. Three-fourths of all U.S.S.R. exports to the FRG were of iron, steel, crude oil, petroleum products, and natural gas; another 5% was of gold. The Soviet Union accounted for 55% of total Council for Mutual Economic Assistance trade with the FRG, making up 2.6% of total FRG trade.[6] In 1982, FRG exports to other centrally planned economy countries (CPEC) in Europe and Asia amounted to $7.6 billion, or 4.8% of the overall export business, the same as FRG exports to Austria. West German imports from CPEC were $7.9 billion or 5.7% of all imports. The biggest FRG trading partner, however, was the Netherlands. The FRG provided 22% of Dutch imports, and accounted for 29% of all Dutch exports in 1982.

Table 2.—Federal Republic of Germany: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Alkaline-earth metals	45	16	--	Italy 11; Japan 2.
Aluminum:				
Ore and concentrate	22,885	33,742	--	Belgium-Luxembourg 9,097; Republic of South Africa 5,773.
Oxides and hydroxides	582,613	438,067	9,420	East Germany 75,699; Austria 68,134.
Ash and residue containing aluminum	10,577	10,210	--	France 4,534; Netherlands 3,244.
Metal including alloys:				
Scrap	69,922	67,719	18	Italy 22,818; France 15,388.
Unwrought	252,970	267,403	3,810	France 63,886; Italy 49,028.
Semimanufactures	405,194	434,174	19,873	France 83,454; United Kingdom 62,651.
Antimony:				
Oxides	481	422	60	Switzerland 48; Taiwan 44.
Metal including alloys, all forms	102	9	NA	NA.
Arsenic: Oxides and acids	967	827	NA	United Kingdom 558; Italy 121.
Beryllium:				
Oxides and hydroxides value, thousands	$8	$5	NA	NA.
Metal including alloys, all forms kilograms	618	33	--	NA.
Bismuth: Metal including alloys, all forms	328	251	93	Yugoslavia 54; United Kingdom 35.
Cadmium: Metal including alloys, all forms	604	617	NA	East Germany 44; unspecified 551.
Cesium and rubidium: Metal including alloys, all forms value, thousands	$28	$21	NA	NA.
Chromium:				
Ore and concentrate	3,459	12,959	--	Belgium-Luxembourg 7,143; Denmark 1,217.
Oxides and hydroxides	46,106	11,622	NA	NA.
Metal including alloys, all forms	164	101	NA	Belgium-Luxembourg 24; Austria 23.
Cobalt:				
Oxides and hydroxides	--	25	--	Belgium-Luxembourg 5; Yugoslavia 5.
Metal including alloys, all forms	619	816	4	Italy 84; unspecified 606.
Columbium and tantalum:				
Ore and concentrate	1,862	1,424	1,223	Netherlands 182.
Metal including alloys, all forms:				
Columbium (niobium)	50	45	NA	NA.
Tantalum	42	75	6	NA.
Copper:				
Matte and speiss including cement copper	282	41	--	Belgium-Luxembourg 21; Sweden 19.
Oxides and hydroxides	2,967	2,562	237	Denmark 373; Norway 220.
Sulfate	1,645	1,680	NA	NA.
Ash and residue containing copper	15,731	15,513	1	Austria 7,197; Belgium-Luxembourg 5,191.
Metal including alloys:				
Scrap	88,881	61,514	31	Italy 17,365; Netherlands 12,677.
Unwrought	95,233	104,114	23	United Kingdom 25,071; East Germany 22,400.
Semimanufactures	388,983	391,080	32,021	France 55,729; Netherlands 39,986.
Gallium: Metal including alloys, all forms kilograms	4,400	6,200	1,500	Japan 3,100; Switzerland 800.
Germanium: Metal including alloys, all forms value, thousands	$387	$388	$42	North Korea $161; United Kingdom $139.
Gold:				
Ash and residue containing gold value, thousands	$98	$222	NA	Netherlands $210.
Waste and sweepings do	$4,131	$1,545	NA	Switzerland $899; Netherlands $477.
Metal including alloys, unwrought and partly wrought thousand troy ounces	1,033	2,111	18	United Kingdom 802; Belgium-Luxembourg 397.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	^{r}6,538	5,763	11	Sweden 2,136; France 1,445.
Pyrite, roasted	^{r}76,826	51,264	--	Belgium-Luxembourg 17,323; Mexico 14,466.

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal:				
Scrap thousand tons	3,514	3,048	(2)	Italy 1,960; Belgium-Luxembourg 352.
Pig iron, cast iron, related materials do.	928	825	(2)	France 332; Spain 86.
Ferroalloys:				
Ferrochromium	55,674	53,988	1,841	France 22,961; Belgium-Luxembourg 4,911.
Ferromanganese	48,876	32,975	NA	Italy 9,618; Austria 5,980.
Ferromolybdenum	912	1,010	NA	East Germany 245; Netherlands 231.
Ferronickel	555	50	--	United Kingdom 37; Finland 9.
Ferrosilicochromium	1,179	2,920	NA	France 1,743; Belgium-Luxembourg 796.
Ferrosilicomanganese	7,832	5,729	NA	Italy 1,606; Belgium-Luxembourg 1,544.
Ferrosilicon	60,956	59,191	82	France 14,537; Belgium-Luxembourg 12,325.
Silicon metal	4,881	5,036	432	France 1,971; Austria 582.
Unspecified	15,820	9,257	917	Austria 910; France 856.
Steel, primary forms thousand tons	3,453	3,185	440	Italy 387; France 382.
Semimanufactures:				
Bars, rods, angles, shapes, sections do.	3,380	2,722	182	France 546; Netherlands 306.
Universals, plates, sheets do.	6,519	5,817	631	U.S.S.R. 824; France 684.
Hoop and strip do.	1,462	1,264	25	U.S.S.R. 177; France 171.
Rails and accessories do.	300	235	44	Italy 63; Netherlands 40.
Wire do.	310	310	14	France 57; Netherlands 51.
Tubes, pipes, fittings do.	4,175	4,111	478	U.S.S.R. 1,076; Netherlands 326.
Castings and forgings, rough do.	117	115	4	France 21; Netherlands 15.
Lead:				
Ore and concentrate	300	55	--	Austria 51.
Oxides	15,893	11,728	126	U.S.S.R. 2,400; Sweden 1,715.
Ash and residue containing lead	10,916	14,774	--	Netherlands 5,547; Belgium-Luxembourg 3,633.
Metal including alloys:				
Scrap	18,550	13,588	--	Netherlands 6,117; Italy 4,555.
Unwrought	96,361	100,622	1,437	Italy 28,352; Austria 12,946.
Semimanufactures	14,928	14,176	23	Denmark 3,286; Switzerland 1,625.
Lithium:				
Oxides and hydroxides	490	510	--	France 250; Belgium-Luxembourg 102.
Metal including alloys, all forms	19	40	--	Switzerland 30; France 6.
Magnesium: Metal including alloys:				
Scrap	1,774	1,686	181	Italy 650; Netherlands 401.
Unwrought	198	323	--	Austria 112; Belgium-Luxembourg 79.
Semimanufactures	857	934	8	Netherlands 231; India 120.
Manganese:				
Ore and concentrate, metallurgical-grade	2,174	1,497	--	France 995; Belgium-Luxembourg 177.
Oxides	355	716	--	Hungary 223; France 160.
Metal including alloys, all forms	43	98	4	Bulgaria 5; unspecified 70.
Mercury 76-pound flasks	3,973	8,077	29	Netherlands 1,856; Pakistan 1,508.
Molybdenum:				
Ore and concentrate	5,428	7,442	100	Belgium-Luxembourg 2,364; Netherlands 1,631.
Metal including alloys:				
Unwrought and scrap	273	391	NA	NA.
Semimanufactures	46	39	(2)	Brazil 9; Japan 9.
Nickel:				
Matte and speiss	52	136	--	All to Netherlands.
Oxides and hydroxides	95	135	--	India 103; United Kingdom 16.
Ash and residue containing nickel	1,692	1,582	--	Netherlands 570; Austria 397.
Metal including alloys:				
Scrap	7,779	7,700	53	Sweden 5,877; Netherlands 784.
Unwrought	4,520	9,461	183	Netherlands 3,788; France 3,087.
Semimanufactures	10,243	9,575	2,571	United Kingdom 1,116; Belgium-Luxembourg 1,048.

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals:				
Waste and sweepings value, thousands	$990	$1,347	NA	Spain $745; Netherlands $537.
Metals including alloys, unwrought and partly wrought:				
Palladium troy ounces	94,544	143,437	23,599	Switzerland 62,647; United Kingdom 23,438.
Platinum do	238,912	238,142	2,921	Switzerland 43,243; Japan 24,435.
Unspecified do	101,497	90,732	8,616	Japan 11,022; Italy 6,044.
Rare-earth metals including alloys, all forms	147	253	NA	NA.
Rhenium: Metal including alloys, all forms value, thousands	$45	$24	NA	NA.
Selenium, elemental and phosphorus	7,800	8,414	NA	NA.
Silver:				
Ash and residue containing silver value, thousands	$2,463	$1,732	NA	United Kingdom $1,026.
Waste and sweepings do	$20,343	$1,266	NA	Spain $423; Switzerland $214.
Metal including alloys, unwrought and partly wrought thousand troy ounces	33,519	43,886	334	East Germany 14,564; Italy 3,450.
Tellurium, elemental and arsenic	21	9	1	Sweden 2; Belgium-Luxembourg 1.
Tin:				
Ash and residue containing tin	5,122	3,025	--	United Kingdom 2,648.
Metal including alloys:				
Scrap	106	133	NA	Netherlands 84; Denmark 43.
Unwrought	4,785	4,025	852	Netherlands 1,558; United Kingdom 483.
Semimanufactures	722	857	4	Austria 172; Switzerland 107.
Titanium:				
Ore and concentrate	8,731	5,377	--	Italy 1,207; Bulgaria 820.
Oxides	52,189	56,028	12,692	Italy 5,299; East Germany 3,880.
Metal including alloys:				
Scrap	1,002	1,043	67	United Kingdom 809; Italy 107.
Unwrought	175	106	--	Netherlands 80; Switzerland 11.
Semimanufactures	955	622	4	France 169; Italy 75.
Tungsten:				
Ash and residue containing tungsten	167	126	--	Austria 91; France 9.
Metal including alloys:				
Scrap	496	304	NA	NA.
Unwrought	485	335	NA	NA.
Semimanufactures	57	72	2	France 16; Sweden 12.
Vanadium:				
Ash and residue containing vanadium	2,175	889	--	Belgium-Luxembourg 341.
Metal including alloys:				
Scrap value, thousands	$2	$4	NA	NA.
Unwrought	193	135	NA	France 71; United Kingdom 40.
Semimanufactures value, thousands	$9	$9	NA	NA.
Zinc:				
Ore and concentrate	105,806	144,537	--	East Germany 51,324; Netherlands 43,923.
Oxides	13,550	19,202	NA	NA.
Blue powder	6,293	4,151	--	Romania 1,129; Netherlands 852.
Matte	6,789	7,470	--	Belgium-Luxembourg 2,855; Spain 1,675.
Ash and residue containing zinc	90,489	98,173	9,121	Belgium-Luxembourg 30,820; France 15,770.
Metal including alloys:				
Scrap	7,502	8,623	6	Netherlands 4,791; Italy 2,434.
Unwrought	126,005	113,602	3,700	Italy 29,229; East Germany 12,861.
Semimanufactures	17,549	18,620	48	East Germany 1,004; unspecified 17,311.
Zirconium: Ore and concentrate	12,372	16,379	--	Italy 2,658; Netherlands 2,361.
Other:				
Oxides and hydroxides	8,206	11,057	NA	NA.
Ashes and residues	64,660	76,210	87	Belgium-Luxembourg 49,066.
Base metals including alloys, all forms	^{r}331	25,066	15	East Germany 24,942.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	310,457	266,971	36	Netherlands 245,258.
Artificial:				
Corundum	51,583	45,755	1,482	Italy 4,914; France 4,266.
Silicon carbide	27,752	22,971	NA	NA.
Dust and powder of precious and semiprecious stones including diamond kilograms	659	743	239	Greece 139; Austria 125.
Grinding and polishing wheels and stones	15,366	13,632	607	France 1,909; Netherlands 1,143.

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Asbestos, crude	43,033	47,239	NA	NA.
Barite and witherite	54,627	39,886	180	France 16,186; Belgium-Luxembourg 4,951.
Boron materials:				
Crude natural borates	4,648	15,717	--	East Germany 10,046; Sweden 3,057.
Oxides and acids	11,573	976	1	Czechoslovakia 200; Yugoslavia 161.
Bromine	10	11	NA	NA.
Cement thousand tons	2,627	2,673	(2)	Netherlands 1,326; Nigeria 370.
Chalk	36,549	48,053	60	Sweden 15,613; Netherlands 14,724.
Clays, crude:				
Andalusite, kyanite, sillimanite	13,573	8,790	--	Italy 3,915; Austria 1,237.
Bentonite	23,956	21,122	--	France 9,374; Belgium-Luxembourg 3,256.
Ceramic	846,033	825,625	NA	Italy 365,408; Netherlands 196,431.
Chamotte earth	47,913	37,277	--	Netherlands 16,888; France 3,980.
Dinas earth	55,771	--		
Fire clay	336,259	360,038	NA	Italy 120,182; Belgium-Luxembourg 11,413.
Fuller's earth	4,485	3,865	--	Netherlands 1,683; France 1,263.
Kaolin	92,602	91,488	NA	Italy 31,555; Switzerland 11,011.
Unspecified	614,774	266,417	160	Netherlands 181,136; France 32,124.
Diamond:				
Gem, not set or strung carats	124,313	134,503	13,282	Belgium-Luxembourg 55,766; Switzerland 35,358.
Industrial do	286,641	249,798	NA	Ireland 123,105; Belgium-Luxembourg 45,582.
Diatomite and other infusorial earth	3,542	2,344	--	East Germany 638; Netherlands 551.
Feldspar, fluorspar, related materials:				
Feldspar	15,308	15,176	--	France 7,411; Netherlands 1,932.
Fluorspar	16,210	13,219	--	Austria 3,799; Netherlands 3,016.
Unspecified	777	1,128	3	Belgium-Luxembourg 1,045.
Fertilizer materials:				
Crude, n.e.s	59,310	58,589	--	Netherlands 50,461.
Manufactured:				
Ammonia thousand tons	249	223	(2)	Denmark 140; France 39.
Nitrogenous do	1,248	959	20	Belgium-Luxembourg 304; Brazil 74.
Phosphatic do	40	45	--	Austria 19; East Germany 9.
Potassic do	2,348	1,997	11	Belgium-Luxembourg 506; Ireland 118.
Unspecified and mixed do	718	957	(2)	Belgium-Luxembourg 278; Austria 131.
Graphite, natural	8,577	10,029	436	Italy 1,760; Austria 1,071.
Gypsum and plaster	374,720	327,411	68	Netherlands 175,380; Belgium-Luxembourg 53,540.
Iodine	73	45	--	Italy 10; France 7.
Lime	398,157	381,361	44	Netherlands 260,721; France 62,317.
Magnesium compounds:				
Magnesite	12,050	8,917	--	France 5,039; Spain 899.
Oxides and hydroxides	6,781	7,849	214	U.S.S.R. 1,666; Italy 1,397.
Other	4,095	8,196	--	Austria 4,558; France 1,085.
Mica:				
Crude including splittings and waste	1,091	879	2	Netherlands 295; Austria 126.
Worked including agglomerated splittings	268	274	(2)	Italy 65; United Kingdom 35.
Phosphates, crude	49,027	1,602	--	Switzerland 1,283; Netherlands 205.
Pigments, mineral:				
Natural, crude	1,424	1,094	353	Switzerland 455.
Iron oxides and hydroxides, processed	150,878	135,935	7,662	France 21,626; United Kingdom 12,194.
Potassium salts, crude	39,881	38,562	--	Belgium-Luxembourg 19,208; United Kingdom 16,284.
Precious and semiprecious stones other than diamond:				
Natural kilograms	181,706	273,194	13,657	China 92,358; Japan 37,247.
Synthetic do	28,384	26,883	2,384	Japan 15,608; Italy 2,551.
Pyrite, unroasted	2,089	2,031	NA	NA.
Quartz crystal, piezoelectric kilograms	r78	96	NA	Iran 13.
Salt and brine thousand tons	2,048	1,942	(2)	Belgium-Luxembourg 1,272; Sweden 213.

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Sodium compounds, n.e.s.:				
Carbonate, manufactured	165,273	160,188	--	Belgium-Luxembourg 42,853; unspecified 71,380.
Sulfate, manufactured	95,038	87,719	--	Belgium-Luxembourg 16,370; Italy 14,263.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	1,569	1,373	(2)	Netherlands 1,243; Switzerland 91.
Worked do.	39	31	(2)	Austria 7; Belgium-Luxembourg 6.
Dolomite, chiefly refractory-grade do.	296	215	--	Netherlands 102; France 77.
Gravel and crushed rock do.	11,057	9,756	(2)	Netherlands 7,755; Switzerland 1,108.
Limestone other than dimension do.	33	44	--	Netherlands 32; Bulgaria 9.
Quartz and quartzite do.	150	132	(2)	Belgium-Luxembourg 58; Netherlands 20.
Sand other than metal-bearing do.	6,717	6,437	(2)	Netherlands 4,718; Belgium-Luxembourg 1,093.
Sulfur:				
Elemental:				
Crude including native and byproduct	448,040	602,558	--	Netherlands 226,189; United Kingdom 66,231.
Colloidal, precipitated, sublimed	454	280	45	Netherlands 88; France 32.
Dioxide	14,446	24,427	--	East Germany 9,412; Netherlands 7,574.
Sulfuric acid	854,928	766,913	16,914	Belgium-Luxembourg 252,604; Netherlands 153,292.
Talc, steatite, soapstone, pyrophyllite	3,757	4,159	--	East Germany 1,410; Yugoslavia 532.
Vermiculite, perlite, chlorite	6,156	4,686	NA	Belgium-Luxembourg 2,543; Netherlands 1,063.
Other:				
Crude thousand tons	1,859	2,381	251	Netherlands 1,562; Belgium-Luxembourg 269.
Slag and dross, not metal-bearing do.	2,973	2,979	1	Netherlands 2,325; France 412.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	135,106	128,828	807	France 27,301; Austria 14,171.
Coal:				
Anthracite and bituminous thousand tons	11,996	9,828	1	France 4,097; Italy 1,988.
Briquets of anthracite and bituminous coal do.	365	349	--	United Kingdom 113; France 98.
Lignite including briquets do.	848	741	--	Belgium-Luxembourg 190; Austria 160.
Coke and semicoke do.	6,515	3,959	--	Belgium-Luxembourg 1,677; France 1,256.
Gas, manufactured million cubic feet	59	39	--	All to Switzerland.
Gas, natural: Gaseous do.	422,643	392,176	NA	NA.
Peat including briquets and litter	510,951	542,127	184	Netherlands 346,167; France 53,729.
Petroleum:				
Crude thousand 42-gallon barrels	7,820	8,335	--	East Germany 7,894; United Kingdom 438.
Refinery products:				
Liquefied petroleum gas do.	6,278	6,710	14	Netherlands 3,012; Italy 1,140.
Gasoline:				
Aviation do.	17	10	--	NA.
Motor do.	12,232	15,853	83	France 2,783; Austria 2,696.
Mineral jelly and wax do.	1,309	1,337	--	Norway 150; Republic of South Africa 102.
Kerosine and jet fuel do.	10,879	9,504	(2)	Switzerland 553; unspecified 7,830.
Distillate fuel oil do.	8,691	7,485	(2)	France 1,628; Netherlands 1,502.
Lubricants do.	3,075	3,258	7	Belgium-Luxembourg 624; United Kingdom 395.
Nonlubricating oils do.	100	320	--	Netherlands 47; United Kingdom 40.
Residual fuel oil do.	22,392	24,543	(2)	United Kingdom 4,644; Netherlands 3,391; bunkers 7,428.
Bitumen and other residues do.	2,284	2,136	--	Austria 601; Denmark 548.
Bituminous mixtures do.	224	131	(2)	Netherlands 31; Austria 23.
Petroleum coke do.	1,654	1,566	--	Netherlands 535; France 264.

[r] Revised. NA Not available.
[1] Table prepared by Jozef Plachy.
[2] Less than 1/2 unit.

Table 3.—Federal Republic of Germany: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	124	3	--	NA.
Alkaline-earth metals	232	236	4	France 164; Canada 38.
Aluminum:				
Ore and concentrate thousand tons	3,911	3,533	6	Australia 1,360; Guinea 791; Brazil 674.
Oxides and hydroxides	470,529	492,196	2,725	Australia 253,406; Italy 152,641.
Ash and residue containing aluminum	51,037	46,260	--	Austria 12,507; Norway 7,752.
Metal including alloys:				
Scrap	160,984	196,801	7,151	Netherlands 38,941; United Kingdom 33,767.
Unwrought	478,446	552,928	3,376	Norway 196,501; United Kingdom 58,924.
Semimanufactures	245,586	253,163	2,670	France 72,438; Belgium-Luxembourg 42,725.
Antimony:				
Ore and concentrate	1,954	1,640	--	Bolivia 768; China 502.
Oxides	3,567	3,899	68	France 1,394; Belgium-Luxembourg 1,123.
Metal including alloys, all forms	595	440	NA	Belgium-Luxembourg 203; China 165.
Arsenic: Oxides and acids	781	501	--	Belgium-Luxembourg 246; France 157.
Bismuth: Metal including alloys, all forms	185	332	NA	Peru 96; United Kingdom 92.
Cadmium:				
Oxides and hydroxides	417	487	--	Belgium-Luxembourg 477.
Metal including alloys, all forms	673	784	NA	Belgium-Luxembourg 199; China 166.
Chromium:				
Ore and concentrate	268,237	244,279	--	Republic of South Africa 140,598; Albania 52,936.
Oxides and hydroxides	1,192	2,676	244	U.S.S.R. 1,461; China 591.
Metal including alloys, all forms	569	600	49	United Kingdom 167; France 163.
Cobalt:				
Oxides and hydroxides	239	308	6	Belgium-Luxembourg 166; United Kingdom 58.
Metal including alloys, all forms	1,212	1,450	21	Zaire 340; Finland 306.
Columbium and tantalum:				
Ore and concentrate	553	185	--	Nigeria 87; Canada 49.
Ash and residue containing columbium and/or tantalum	9,214	1,383	35	China 647; Nigeria 140.
Metal including alloys, all forms:				
Columbium (niobium)	32	24	19	France 2; Switzerland 1.
Tantalum	114	102	84	France 5; Belgium-Luxembourg 3.
Copper:				
Ore and concentrate	481,142	553,963	58,146	Papua New Guinea 246,128; Mexico 114,300.
Matte and speiss including cement copper	4,675	6,309	--	Australia 5,308; Canada 622.
Oxides and hydroxides	668	750	NA	Belgium-Luxembourg 465; Italy 165.
Sulfate	9,356	9,305	--	Belgium-Luxembourg 2,146; France 2,141.
Ash and residue containing copper	34,586	20,638	185	Italy 6,648; Switzerland 3,077.
Metal including alloys:				
Scrap	151,352	177,122	7,868	France 40,576; United Kingdom 39,108.
Unwrought	492,588	544,079	1,638	Chile 135,155; Poland 94,685; Belgium-Luxembourg 88,886.
Semimanufactures	214,262	243,796	1,787	Belgium-Luxembourg 86,236; France 56,763.
Gold:				
Ore and concentrate value, thousands	$14,031	$17,867	$13,771	Denmark $741; Switzerland $588.
Waste and sweepings do	$53,149	$25,069	$1,948	Peru $7,387; Sweden $3,634.
Metal including alloys, unwrought and partly wrought thousand troy ounces	2,945	3,879	454	Switzerland 973; U.S.S.R. 599.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	44,288	38,910	(2)	Brazil 13,870; Liberia 6,105; Canada 6,104.
Pyrite, roasted do	540	430	--	Spain 248; Belgium-Luxembourg 159.
Metal:				
Scrap do	1,359	1,289	21	Netherlands 424; United Kingdom 209.
Pig iron, cast iron, related materials	264,285	269,217	101	Brazil 72,042; Canada 71,991.
Ferroalloys:				
Ferroaluminum	210	268	125	France 93.
Ferrochromium	148,161	219,884	676	Republic of South Africa 122,198; Zimbabwe 38,031.
Ferromanganese	103,111	96,538	--	Norway 44,072; France 28,505.
Ferromolybdenum	5,111	4,207	91	Belgium-Luxembourg 2,829.
Ferronickel	64,805	33,358	--	New Caledonia 13,086; Greece 9,251.
Ferrosilicochromium	12,870	7,570	--	Zimbabwe 5,775; Sweden 854.
Ferrosilicomanganese	121,177	110,704	--	Norway 61,621; Republic of South Africa 15,308.
Ferrosilicon	196,904	193,258	557	Norway 104,600; France 24,333.
Silicon metal	52,786	51,703	--	Norway 15,569; France 12,040.
Unspecified	[r]14,722	12,201	220	France 3,242; Brazil 2,736.
Steel, primary forms thousand tons	2,139	1,501	(2)	Belgium-Luxembourg 290; Netherlands 182.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	4,120	3,663	1	Belgium-Luxembourg 735; Italy 719.
Universals, plates, sheets do	3,836	3,539	7	Belgium-Luxembourg 920; France 595.
Hoop and strip do	601	502	1	Belgium-Luxembourg 186; France 136.
Rails and accessories do	28	23	(2)	Sweden 9; Netherlands 4.
Wire do	271	244	(2)	Belgium-Luxembourg 91; France 36.
Tubes, pipes, fittings do	829	767	3	Italy 150; France 121; Netherlands 104.
Castings and forgings, rough do	80	39	(2)	France 7; Netherlands 4.
Lead:				
Ore and concentrate	214,800	192,371	--	Canada 37,887; Sweden 33,244.
Oxides	5,609	8,329	41	Belgium-Luxembourg 2,963; unspecified 3,760.
Ash and residue containing lead	14,676	19,244	2,034	Australia 5,607; France 3,512.
Metal including alloys:				
Scrap	34,594	35,606	2,729	Netherlands 87; France 60.
Unwrought	115,786	153,977	4,708	United Kingdom 47,600; Sweden 24,649.
Semimanufactures	3,279	3,151	9	Belgium-Luxembourg 1,787; France 812.
Lithium:				
Oxides and hydroxides	1,205	1,684	219	Netherlands 87; France 60.
Metal including alloys, all forms	7	14	13	France 1.
Magnesium: Metal including alloys:				
Scrap	1,123	2,135	--	Netherlands 445; Sweden 409.
Unwrought	26,639	26,886	6,307	Norway 11,081; Italy 4,295.
Semimanufactures	682	858	41	Austria 322; France 249.
Manganese:				
Ore and concentrate, metallurgical-grade	606,851	393,546	--	Republic of South Africa 260,763; Australia 90,318.
Oxides	2,794	4,198	56	Belgium-Luxembourg 2,432; Greece 933.
Metal including alloys, all forms	5,147	5,989	845	Republic of South Africa 3,367; France 759.
Mercury 76-pound flasks	6,154	7,038	232	China 1,769; Spain 1,160.
Molybdenum:				
Ore and concentrate	18,139	21,524	6,150	Canada 3,885; Chile 3,507.
Oxides and hydroxides	502	265	14	Netherlands 131; Austria 44.
Metal including alloys:				
Scrap	521	381	--	Austria 336; United Kingdom 16.
Unwrought	131	51	18	United Kingdom 9; France 7.
Semimanufactures	332	333	66	Austria 227; United Kingdom 16.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Nickel:				
Ore and concentrate	70	571	--	Albania 458; Netherlands 12.
Matte and speiss	12,361	13,847	--	Australia 11,162; Cuba 2,339.
Oxides and hydroxides	315	193	--	Canada 89; Netherlands 62.
Ash and residue containing nickel	2,113	2,244	157	Spain 470; United Kingdom 335.
Metal including alloys:				
Scrap	5,469	6,419	945	France 1,524; United Kingdom 1,089.
Unwrought	39,928	41,322	5,229	U.S.S.R. 12,996; Australia 4,293.
Semimanufactures	5,833	8,818	632	France 2,764; Belgium-Luxembourg 1,337.
Platinum-group metals:				
Ash and residue containing platinum value, thousands	$2,093	$4,588	$3,851	Italy $253; United Kingdom $155.
Waste and sweepings do	$42,277	$31,174	$1,823	Netherlands $6,833; Hungary $4,878.
Metals including alloys, unwrought and partly wrought:				
Palladium troy ounces	317,128	853,706	522,325	U.S.S.R. 185,576; United Kingdom 100,793.
Platinum do	473,210	777,382	385,912	United Kingdom 122,694; Switzerland 122,179.
Unspecified do	106,409	96,854	49,699	Republic of South Africa 24,955.
Rare-earth metal including alloys, all forms	76	74	NA	NA.
Rhenium: Metal including alloys, all forms value, thousands	$267	$320	NA	Italy $296.
Selenium, elemental and phosphorus	30,014	26,213	NA	NA.
Silicon, high-purity	18	92	--	Italy 71; United Kingdom 12.
Silver:				
Ash and residue containing silver value, thousands	$19,454	$23,584	$14,343	Sweden $2,091; Switzerland $2,048.
Waste and sweepings do	$16,987	$13,861	$915	Argentina $5,699; Hong Kong $871.
Metal including alloys, unwrought and partly wrought thousand troy ounces	25,957	40,847	3,930	United Kingdom 11,979; Sweden 4,483.
Tellurium, elemental and arsenic	75	77	--	Sweden 25; Netherlands 15.
Tin:				
Ore and concentrate	3,229	1,766	--	Bolivia 1,542; Peru 198.
Oxides	35	51	--	Netherlands 16; Italy 15.
Ash and residue containing tin	4,253	4,335	665	Singapore 980; Netherlands 550.
Metal including alloys:				
Scrap	344	448	--	Netherlands 174; United Kingdom 106.
Unwrought	17,052	16,342	135	Thailand 5,130; Indonesia 3,842.
Semimanufactures	989	1,233	2	Netherlands 1,108.
Titanium:				
Ore and concentrate	538,968	409,412	1,053	Norway 239,397; Canada 97,994.
Oxides	20,691	20,824	2,674	Belgium-Luxembourg 10,438; France 3,328.
Metal including alloys:				
Scrap	395	177	76	France 35; United Kingdom 23.
Unwrought	3,125	1,778	348	U.S.S.R. 836; Japan 591.
Semimanufactures	1,324	1,280	215	Japan 748; United Kingdom 257.
Tungsten:				
Ore and concentrate	2,698	2,855	20	Canada 789; China 625.
Oxides and hydroxides	33	8	2	NA.
Ash and residue containing tungsten	282	300	109	France 99; Sweden 67.
Metal including alloys:				
Scrap	781	380	44	United Kingdom 89; France 78.
Unwrought	273	394	4	Austria 295; Republic of Korea 39.
Semimanufactures	78	67	11	Austria 28; Netherlands 11.
Uranium and/or thorium:				
Oxides and other compounds	550	146	NA	NA.
Metal including alloys, all forms, uranium value, thousands	$27	$111	$110	NA.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Vanadium:				
Oxides and hydroxides	2,224	2,360	103	China 858; unspecified 1,369.
Ash and residue containing vanadium	36,685	29,878	--	China 2,643; unspecified 26,090.
Metal including alloys value, thousands	$44	$13	--	NA.
Zinc:				
Ore and concentrate	506,148	556,903	8,144	Canada 172,293; Greenland 63,330.
Oxides	6,377	9,447	13	Netherlands 2,837; France 2,794.
Blue powder	12,009	12,678	--	Belgium-Luxembourg 7,399; Netherlands 1,796.
Matte	4,986	5,765	--	Netherlands 2,039; United Kingdom 781.
Ash and residue containing zinc	125,630	93,312	3,670	Belgium-Luxembourg 19,336; United Kingdom 16,321.
Metal including alloys:				
Scrap	23,968	16,552	840	Netherlands 5,030; Denmark 2,038.
Unwrought	137,964	156,376	869	Belgium-Luxembourg 58,080; Netherlands 32,511.
Semimanufactures	24,990	29,295	4	France 22,400; Netherlands 3,344.
Zirconium:				
Ore and concentrate	69,444	67,648	3,802	Australia 34,095; Republic of South Africa 25,484.
Metal including alloys, semimanufactures	150	386	119	France 234; Sweden 31.
Other:				
Ores and concentrates	9,852	11,511	NA	Chile 10,937; Cyprus 200.
Oxides and hydroxides	2,447	3,711	2,095	France 355; United Kingdom 308.
Ashes and residues	286,215	236,377	4,703	Canada 172,947; Algeria 8,638.
Base metals including alloys, all forms	r1,015	1,129	545	Sweden 260; Belgium-Luxembourg 59.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	133,008	64,620	1,144	Greece 40,463; Italy 17,338.
Artificial:				
Corundum	41,209	39,328	716	Netherlands 11,176; Hungary 6,488.
Silicon carbide	67,530	66,540	28	Norway 13,668; Italy 3,775.
Dust and powder of precious and semiprecious stones including diamond	201	219	217	Ireland 1.
Grinding and polishing wheels and stones	8,475	6,955	188	Austria 1,496; Italy 988.
Asbestos, crude	171,708	151,555	652	Canada 105,733; Italy 18,720.
Barite and witherite	166,066	174,976	--	France 81,104; China 43,800.
Boron materials:				
Crude natural borates	124,085	105,759	64,390	Turkey 37,319; Netherlands 1,998.
Oxides and acids	17,491	17,418	51	France 7,395; Turkey 4,924.
Bromine	2,908	3,361	--	Israel 2,668; United Kingdom 345.
Cement thousand tons	1,816	1,728	([2])	East Germany 500; Belgium-Luxembourg 438.
Chalk	130,773	120,428	7	France 94,385; Belgium-Luxembourg 14,691.
Clays, crude:				
Andalusite, kyanite, sillimanite	70,473	82,053	49,186	Republic of South Africa 29,825.
Bentonite	77,231	70,476	9,334	Greece 48,188; Turkey 2,749.
Ceramic	93,337	84,053	--	France 24,978; Netherlands 18,751.
Chamotte earth	77,216	81,774	3,215	Czechoslovakia 35,888; France 25,044.
Dinas earth	1,100	--		
Fire clay	101,108	77,659	3,531	Czechoslovakia 29,078; France 22,499.
Fuller's earth	5,706	5,369	2,864	Spain 1,213; United Kingdom 995.
Kaolin	834,114	851,426	116,085	United Kingdom 421,363; Czechoslovakia 126,693.
Unspecified	138,098	124,745	12,121	France 35,424; Czechoslovakia 30,526.
Cryolite and chiolite	2,113	1,705	--	All from Greenland.
Diamond:				
Gem, not set or strung carats	496,478	493,004	5,934	Belgium-Luxembourg 227,397; U.S.S.R. 92,894.
Industrial do	961,711	864,233	14,397	Republic of South Africa 400,092; Belgium-Luxembourg 271,761.
Diatomite and other infusorial earth	36,421	37,780	6,380	Denmark 21,362; France 6,946.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Feldspar, fluorspar, related materials:				
Feldspar	60,031	54,006	19	Norway 21,946; Italy 13,367.
Fluorspar	203,110	205,698	--	Republic of South Africa 51,191; China 43,290.
Unspecified	49,761	59,646	--	Norway 43,393; Netherlands 14,331.
Fertilizer materials:				
Crude, n.e.s	28,004	30,494	1,237	Netherlands 22,530; Italy 1,643.
Manufactured:				
Ammonia thousand tons	310	141	(2)	France 57; Austria 31.
Nitrogenous do	2,186	3,135	45	East Germany 944; Netherlands 820.
Phosphatic do	916	860	3	Belgium-Luxembourg 679; France 98.
Potassic do	88	87	--	France 80.
Unspecified and mixed do	948	1,308	47	Belgium-Luxembourg 240; Austria 218.
Graphite, natural	29,762	32,433	242	China 8,640; Austria 4,293.
Gypsum and plaster	766,096	712,889	66	France 449,481; Australia 162,337.
Iodine	1,290	1,134	123	Chile 503; Japan 495.
Lime	225,723	262,057	--	France 149,791; East Germany 42,265.
Magnesium compounds:				
Magnesite	251,469	230,732	3,977	Greece 53,954; Czechoslovakia 34,644.
Oxides and hydroxides	5,014	3,577	159	France 2,009; Japan 493.
Other	85,028	89,525	697	China 21,570; Greece 21,261; Austria 19,945.
Mica:				
Crude including splittings and waste	9,074	11,345	232	India 3,989; France 2,697.
Worked including agglomerated splittings	613	559	7	France 188; Belgium-Luxembourg 169.
Nitrates, crude	5,550	3,555	--	Chile 3,504.
Phosphates, crude thousand tons	2,210	1,931	906	Israel 161; unspecified 810.
Pigments, mineral:				
Natural, crude	187	453	NA	Cyprus 122.
Iron oxides and hydroxides, processed	6,089	10,085	2,827	Netherlands 2,478; Belgium-Luxembourg 1,890.
Potassium salts, crude	84,733	86,753	--	East Germany 86,743.
Precious and semiprecious stones other than diamond:				
Natural	1,340	838	84	Brazil 445; Republic of South Africa 108.
Synthetic	44	37	17	Switzerland 11; Bulgaria 4.
Pyrite, unroasted	57,735	71,472	--	Yugoslavia 20,953; Hungary 20,164.
Quartz crystal, piezoelectric kilograms	190	39	32	NA.
Salt and brine	701,547	801,054	24	Netherlands 450,844; East Germany 151,373.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	211,700	181,748	53	Netherlands 56,985; unspecified 93,856.
Sulfate, manufactured	48,450	42,905	--	Austria 20,045; United Kingdom 12,694.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	469	906	(2)	East Germany 437; Austria 80.
Worked do	709	653	(2)	Italy 384; Portugal 129.
Dolomite, chiefly refractory-grade do	570	545	(2)	Belgium-Luxembourg 482.
Gravel and crushed rock do	14,466	10,097	(2)	France 6,182; Denmark 1,434.
Limestone other than dimension do	1,038	1,116	--	Austria 577; France 284.
Quartz and quartzite do	100	87	1	Belgium-Luxembourg 29; Netherlands 26.
Sand other than metal-bearing do	4,051	5,810	(2)	East Germany 2,677; France 2,101.
Sulfur:				
Elemental:				
Crude including native and byproduct	277,808	287,861	58,101	Poland 118,589; Canada 103,635.
Colloidal, precipitated, sublimed	507	635	1	France 500; East Germany 45.
Dioxide	7,153	5,303	--	Sweden 4,030; Switzerland 879.
Sulfuric acid	45,704	44,574	--	Switzerland 16,856; France 10,010.
Talc, steatite, soapstone, pyrophyllite	122,477	121,699	502	Austria 57,601; France 23,932.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Vermiculite, perlite, chlorite	106,557	101,781	--	Greece 69,570; Hungary 13,463.
Other:				
Crude thousand tons	1,142	1,266	9	Norway 485; Austria 169.
Slag and dross, not metal-bearing do	1,820	1,774	22	France 838; Belgium-Luxembourg 599.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	15,099	13,716	6,027	Trinidad and Tobago 6,960.
Carbon:				
Carbon black	3,249	5,259	27	Netherlands 3,273; United Kingdom 1,742.
Gas carbon	44,255	40,448	1,380	France 18,762; Netherlands 9,693.
Coal:				
Anthracite and bituminous thousand tons	10,320	10,635	2,482	Republic of South Africa 2,295; Poland 1,906.
Lignite including briquets do	3,971	2,681	(2)	Czechoslovakia 2,663.
Coke and semicoke do	1,111	910	97	France 346; United Kingdom 184.
Gas, natural: Gaseous million cubic feet	2,000,966	1,835,438	NA	NA.
Peat including briquets and litter	55,510	37,093	--	U.S.S.R. 32,343; Poland 2,269.
Petroleum:				
Crude thousand 42-gallon barrels	586,135	536,436	--	Saudi Arabia 124,885; United Kingdom 111,733; Libya 83,856.
Refinery products:				
Liquefied petroleum gas do	7,261	8,584	4	Netherlands 2,139; Saudi Arabia 1,726.
Gasoline:				
Aviation do	1,474	3,522	--	Netherlands 1,814; France 730.
Motor do	74,257	78,712	192	Netherlands 28,312; U.S.S.R. 18,929.
Mineral jelly and wax do	1,605	1,560	2	Netherlands 218; unspecified 902.
Kerosine and jet fuel do	17,366	18,888	87	Netherlands 10,424; Belgium-Luxembourg 4,102.
Distillate fuel oil do	105,126	96,876	750	Netherlands 42,190; Belgium-Luxembourg 14,819.
Lubricants do	1,708	1,672	71	France 401; United Kingdom 387; Italy 231.
Nonlubricating oils do	73	55	5	Belgium-Luxembourg 22; France 16.
Residual fuel oil do	43,521	45,938	1,713	Netherlands 15,659; U.S.S.R. 5,907.
Bitumen and other residues do	1,872	1,276	(2)	Netherlands 701; France 417.
Bituminous mixtures do	146	110	5	Netherlands 65; France 11.
Petroleum coke do	5,701	6,331	5,251	Netherlands 399; Argentina 316.

[r] Revised. NA Not available.

[1] Table prepared by Jozef Plachy.

[2] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—Kaiser Aluminum Europe (KAE), a wholly owned subsidiary of Kaiser Aluminum & Chemicals Corp., expanded its rolling mill at Koblenz in June. The expansion and modernization cost the company $50 million, doubling its plate producing capacity. The mill in 1982 produced 12% of the company's total raw aluminum and produced and sold 15% of its fabricated products. KAE also operated an 80,000-ton-capacity primary smelter at Voerde near Duisburg in 1983, employing about 500 workers; a cable plant in Berlin—Kaiser Aluminium Kobelwerk GmbH; and other foil, converting, and canning plants in the FRG, Austria, and Belgium. Only 18 people were employed at the company's main office at Dusseldorf. The company had been profitable since its independent start in 1975, except in 1982. Aluminum plate was the company's key product, representing 40% of Koblenz's output, and approaching 50%

with the new modernization. About one-half of the output by the Koblenz mill was exported to the Near and Middle East, and the rest went mostly to the EEC countries. Most of the alumina for the smelter at Voerde was imported from Sardinia on a barter basis.

In another corporate development, the Swedish aluminum extrusions company Sapa AB acquired a 49% ownership of the Aluminium Werke Offenburg GmbH (AWO), assuming management responsibility in October 1983. After an expansion in the 1970's, AWO went into bankruptcy in 1982 and since then was owned and run by the Badische Kommunale Landesbank. The bank was to continue to hold the majority 51% ownership, although Sapa was to manage the company. The plant and equipment of the company were very modern, including two extrusion presses with a combined capacity of about 10,000 tons per year and anodizing and fabricating facilities.

FRG's largest primary aluminum producer, VAW, recovered in 1983 after losses of over $37 million in 1982. By the spring of 1983, an increase in demand and rising prices benefited the company.

Copper.—Production of refined copper has increased steadily since 1980, despite the world copper oversupply. Norddeutsche Affinerie AG, with a smelter at Hamburg, produced over 50% of total output. The FRG imported all of its raw copper requirements, including most of the scrap, from more or less the same sources for many years at similar quantities and prices, as shown in table 4.

Table 4.—Federal Republic of Germany: Imports of copper materials

Material	1981		1982		1983	
	Quantity (thousand metric tons)	Value (millions)	Quantity (thousand metric tons)	Value (millions)	Quantity (thousand metric tons)	Value (millions)
Ores, etc	997.0	$259	907.4	$222	521.2	$222
Processed	636.1	778	717.6	889	648.0	926
Semifinished	182.3	333	205.5	333	190.5	333
Finished	21.3	111	19.5	111	20.4	111
Total	1,836.7	1,481	1,850.0	1,555	1,380.1	1,592

The largest supplier of nonrefined copper was the Republic of South Africa, at 18,500 tons or 28% of all imports; France, the United Kingdom, and the Netherlands delivered over 55% of all scrap.

Ferroalloys.—The FRG, although a significant producer of steel, was a net importer of finished ferroalloys and was fully dependent on the importation of ores. The production of blast furnace ferroalloys had been decreasing steadily since 1978, with no changes foreseen in the future. Electrowerk Weisweiler GmbH, a subsidiary of Fried. Krupp GmbH, was the principal ferrochromium producer in the FRG. Ferrovanadium was produced by several companies, Hermann C. Stark Berlin being one of the major ones. A substantial producer, Metallhütte Mark AG, a subsidiary of Klöckner Werke AG, planned the closure of its plants in Hamburg in 1984. The company already cut its production of alloys in recent years to vanadium and tungsten owing to unfavorable market conditions.

Gallium.—There were three major gallium producers in the FRG, Preussag AG being the largest. The company's subsidiary, Preussag Metall AG, opened a new plant at Langelsheim near Goslar for the extraction of gallium from gallium arsenide scrap supplied by the domestic consuming industry. The plant is able to refine gallium to a very high purity, at least 99.9999%, and increased the company's annual capacity for extracting gallium to 8 tons from 2 to 3 tons previously.

The second largest gallium producer, VAW, also reported doubling the annual capacity of its plant at Lunen to 5 tons of high-purity electrolytic gallium. The combined annual capacity of the two plants was thus 13 tons, more than double the country's exports of 5.6 tons. The expanded production was apparently in response to demand by the electric industry for solid-state devices.

Iron and Steel.—The FRG was the fifth largest steel producer in the world, accounting for 5.4% of total output. FRG's largest steelmaker, Thyssen AG at 9.45 million tons, was in 10th place worldwide, which was a drop from its 6th place in 1982. Since the boom year of 1974 when steel production was over 53 million tons, output has declined steadily, except for a short interim peak in 1979. Both pig iron and crude steel production continued to fall with corresponding drops in employment and capacity. The total number of iron and steel workers dropped to 227,913 from 251,754 in 1982. Between 1974 and 1983 about 63,000 jobs were eliminated in the steel industry. Steel consumption declined once again in 1983.

Capacity in the iron and steel industry in 1982 and 1983 was as follows, in thousand metric tons:

	1982	1983
Pig iron and blast furnace ferroalloys	48.7	46.0
Steel, crude	65.4	64.0
Of which: Oxygen converter	54.3	53.5

The West German Government continued to attempt to resolve the steel restructuring plans, but the efforts collapsed again because the companies involved rejected the Government's aid package. The steel industry was supposed to reorganize its five major producers into two viable new groups, the Rhine Group consisting of Thyssen AG and Krupp AG, and the Ruhr Group with Hoesch AG, Klöckner AG, and Peine-Salzgitter AG. Instead of the $1.1 billion Government matching aid package, the companies wanted a $3.7 to $4.4 billion subsidy. The restructuring also stalled because Hoesch and Peine-Salzgitter were against the merging with Klöckner, because of the latter's poor economic performance. Since 1975, about $30 billion was spent by the Government on the nationalized steel companies alone.[7]

In addition to the $1.1 billion, the Government had already provided $66.7 million for the seventh rescue since 1978 to the troubled ARBED Saarstahl Group. In 1983, only Saarstahl was subsidized. The company was kept in business during the year primarily to save 16,000 jobs in a high-unemployment area near the French border. ARBED Saarstahl closed its coking plant at Saarbrucken-Burbach and announced the sale of 76% of its shares.

The biggest change, however, was the collapse of Korf Stahl AG and Korf Industrie & Handel AG. The result was the joining of Korf's engineering company with Austria's Voest-Alpine AG Group and the formation of two of Korf's minimills as independent companies. One of them, Badische Stahlwerke AG, formed a new group of former Korf companies. The other Korf minimill subsidiary, Hamburg Stahlwerke AG, declared bankruptcy but with plans to form into a new company.

Thyssen closed its plate mill at Oberhausen and formed two new holding companies, one for carbon steel, Thyssen Stahl AG, and the other for special steel, Thyssen Edelstahlwerke AG. Klöckner Werke, FRG's sixth largest steel producer, closed its works at Hospe and announced cuts at its Bremen hot-strip mill as part of the company's restructuring plans. Klöckner Werke's subsidiary, Maxhütte-Eisenhandel GmbH at Sulzbach-Rosenberg, announced plans to merge with Eschweiler Bergwerks-Verein AG, the small West German subsidiary of the ARBED Group. Hoesch Werke AG in Dortmund operated at a profit as a separate company after Hoesch AG formally dissolved its tie with the Netherlands' Hoogovens BV in 1983. During the year, the work force was cut by 3,500 to 38,200, and the company narrowed its product range by the elimination of heavy plate production.

FRG's iron ore production continued a steady decline, and steelmakers depended heavily on imports from Brazil, Liberia, Canada, and other countries. The lowered steel production, however, created an oversupply of ore, and ore stocks grew to much higher levels than expected. The five operating mines employed 630 workers.

The West German ferrous scrap industry did fairly well, delivering about 7.8 million tons to steelworks, 2.1 million tons to foundries, and 3 million tons for export, which was an increase of 9.1% over that of 1982. Italy was the largest purchaser of West German scrap.

Lead and Zinc.—The extraction of lead and zinc was the only sizable metallic ore mining activity, except for some iron ore, in the FRG. The industry employed about

1,170 workers, and domestic mining supplied only 20% of concentrates used by the smelters. The mining of lead and zinc ore and the production of metals, although increased in 1983, remained at almost the same level for the past several years. Preussag and Metallgesellschaft virtually controlled the lead-zinc industry. The companies depended heavily on battery scrap feed for production of secondary smelter lead. Shortages of scrap, however, caused a lengthy shutdown of Metallgesellschaft's Braubach GmbH smelter. The plant had 40,000 tons per year of capacity and was being equipped with a new battery breaker. Prior to that, the feed material was broken up at Metallgesellschaft's primary lead smelter in Stolberg. The shortage of scrap in the FRG was apparently affected by significant expansions of secondary lead capacity in France, which was previously a major source of scrap lead for West German smelters.

The zinc industry did better than lead and rebounded from its 3-year decline. Metallgesellschaft and Preussag were the only companies dominating the industry. Between them, they operated four zinc smelters. There were two electrolytic plants, one at Detteln in the Ruhr and the other at Nordenham; one Imperial smelting furnace at Duisburg was operated by Metallgesellschaft's "Berzelius" Metallhütten AG, and Preussag operated its 80,000-ton-capacity secondary smelter at Harlingerode near Goslar. As in previous years, domestic mining supplied about 33% of zinc concentrate.

In a related development, Thyssen Stahl installed an electrolytic zinc coating line at its works at Bruckhausen, replacing the existing line that was installed 20 years ago. The new line was able to handle coil up to 0.4 to 3 millimeters thick and 600 to 1,500 millimeters wide and up to 28 tons in weight, and was operating at 16,500 tons per month of capacity.

Nickel.—Production of nickel remained stable for several years, much of the ore being imported from Canada, Chile, and through Belgium-Luxembourg. The largest nickel alloying company, Vereinigte Deutsche Metallwerke AG (VDM), a 98.9% subsidiary of Metallgesellschaft, has reportedly installed a new nickel sheet and plating plant at its Altena works near Dortmund, costing $15 million. The plant includes a cold-rolling sheet and plating mill for nickel and special steel products up to 8.6 feet wide and a finishing line. Prior to that, only hot-rolled products were produced. VDM reportedly supplied over 50% of the 2,000 to 3,000 tons per year of nickel alloy flat products to Europe.

NONMETALS

Bromine.—Bromine in the FRG was produced as a coproduct in the processing of potash. Kali und Salz AG was the sole producer of bromine in two mines. The Salzdetfurth Mine at Bad Salzdetfurth and the Bergmannssegen-Hugo Mine at Lehrte, both at the foothills of the Harz Mountains, had a total annual capacity of 4 million tons.

Calcium Carbonate.—The largest producer of natural chalk whiting in the FRG was Vereinigte Kreidewerke Dammann KG, which operated one plant at Sohlde, southeast of Hannover, at 250,000-ton capacity, and a second plant at Lagerdorf northwest of Hamburg, at 100,000-ton capacity. Products from Sohlde were marketed under the name Mikrosohl and contained 0.01% manganese among other elements, and products from Lagerdorf were marketed under the name Nordweiss and were deficient in manganese. A smaller producer operating in the same area was Kreidewerke Wolpers KG at a capacity of 50,000 tons.

Omya GmbH of Cologne, a member of the Pluss-Staufer Group, produced Ulmer Weiss, a very pure limestone of Upper Jurassic age in the Blautal area west of Ulm. Output was about 100,000 tons. Steinwerke Mühlenbein GmbH operated limestone plants of Niederhof at 150,000-ton capacity and 150,000 tons of diabase, and 20,000 tons of limestone and 2,000 tons of calcite at Modefeld-Radlinghausen in central FRG. Limestone and calcite powders at 22,000 tons and 30,000 tons per year of limestone and diabase chippings were processed at the Niederhof plant.

There were two main producers of precipitated calcium carbonate in the FRG, Johann Schäffer Kalkwerke KG and Deutsche Solvay Werke AG at Rheignberg near Essen, the latter a member of the Solvay Group. Johann Schäffer company produced about 35,000 tons of precipitated calcium carbonate at Haunstettin.[8]

Dolomite.—Of the seven producers of dolomite in the FRG, the largest company was Dolomitwerke GmbH at Wulfrath in west-central FRG, 50% owned by Thyssen and 50% by Hoesch Werke. The company has almost 80 years of experience in the production of lime, cement, and refractories. The main market for the company's products was the steel plants of the Ruhr District. The total tonnage of limestone and raw dolomite usually quarried at Hagen-Holden is 2.2 million tons. Sales of products ranged from raw dolomite fines through calcined and sintered dolomite to tar-bonded, tempered dolomite bricks and ceramic-bonded dolomite bricks. Unburned products accounted for about 1.6 million tons; burned products, 320,000 tons; sintered dolomite, 70,000 tons; and refractory products, 25,000 tons. Other plants producing dolomite were located at Aachen, Fretter, Gersheim, Holenbrum, Lugerdorf, Rupprechstegen, and Sohlde.

Gypsum and Anhydrite.—The production of gypsum and anhydrite continued its slow but regular decline for the fifth year. Nevertheless, the FRG has maintained its position as the second largest European producer of raw gypsum, with output fluctuating from 5 to 5.5 million tons, one-fourth of which was anhydrite. Most sources outside the FRG quote production figures of about 1.7 to 2 million tons, probably because large quantities of the products are used for domestic consumption by the major construction companies. In 1982, for example, only 327,411 tons was exported to neighboring countries. The FRG has gained a reputation as the world's leading producer of specialty gypsum used in molding, dental, and pharmaceutical applications, where very high-purity gypsum is a stringent requirement. The major producer of the specialty gypsum was Borgards GmbH, a subsidiary of Intergips SA of Switzerland. The main operations were located south of the Harz Mountains in Lower Saxony. The plant exported its specialty products to over 60 countries through its sales agent Whitfield and Son Ltd. of the United Kingdom. Most of the West German gypsum reserves were distributed in Lower Saxony, Baden-Württemberg, the Upper Weser area, the Egge region, the Teutoburger Forest, and Franconia. Of the eight major producers, the largest producer, with 3 million tons per year of raw gypsum, was Gebr. Knauf Westdeutsche Gipswerke, located at Iphofen in Bavaria, with subsidiaries in Austria, Belgium, Spain, and the United Kingdom; mines and quarries were distributed throughout northern Bavaria, with numerous processing plants.

Lithium.—Metallgesellschaft's lithium plant in Langelsheim was the largest European producer of lithium compounds and catalysts. The company filed a dumping charge before the EEC against the United States, Soviet, and Chinese producers of lithium hydroxide, a lithium compound widely used in multipurpose lubricating greases. Europe represented approximately 43% of the U.S. lithium hydroxide export market.

Sulfur.—The production of sulfur in 1983 was the lowest since 1977, owing mainly to gas pipelining problems, the rationalization of refinery capacity, and declining trade. The FRG was, nevertheless, Western Europe's second largest sulfur producer, which came from three sources. Most of the sulfur was recovered from the sour natural gasfields of Lower Saxony at Duste, Lingen, Grossenkneten, and Suligen by Wintershall AG, Mobil Oil AG, and Gewerkschaften Brigitta und Elwerath Betriebsfuhrungs GmbH. The rest came from the oil refineries of Esso AG, Deutsche Shell AG, and Veba Oil AG, with small quantities coming from coking plants and power stations.

MINERAL FUELS

The production of all forms of mineral fuels in the FRG continued a steady decline. The FRG imported about one-fifth of its petroleum and natural gas requirements from the Soviet Union, which represented about 6.5% of the country's total primary consumption.

The consumption of primary energy went up only slightly in 1983, except that of oil and lignite. Electricity generation from nuclear power rose only 2.8%, the lowest increase in 5 years. Trends in primary energy consumption for the last 2 years are illustrated in the following table, in million metric tons of coal equivalent:[9]

Source	1982		1983		Quantity change (percent)
	Quantity	Share (percent)	Quantity	Share (percent)	
Petroleum	159.8	44.2	156.0	43.1	-2.4
Hard coal	76.7	21.2	78.5	21.7	+2.3
Natural gas	54.3	15.0	55.5	15.3	+2.2
Brown coal	38.4	10.6	38.2	10.6	-.5
Nuclear power	20.9	5.8	21.5	5.9	+2.9
Hydroelectric	8.1	2.3	9.0	2.5	+11.1
Other	3.3	.9	3.3	.9	--
Total or average	361.5	100.0	362.0	100.0	+.1

Coal.—Although production by coal mines, primarily that of bituminous coal and lignite, remained more or less stable for the last 5 years, the labor force has lost almost 230,000 workers, to the present number of 180,000. Cuts in capacity and reduction of stocks were unavoidable, and the only reason the industry was subsidized was because coal was the FRG's only major indigenous source of energy.

Hard coal in the FRG continued to be produced in four districts, at approximately the following rates: the Ruhr, 79%; the Saar, 12%; Aachen, 6%; and Ibbenburen, 3%. The coal was extracted almost exclusively by the longwall mining method. Of the active 218 longwall faces, 168 were in the Ruhr, 25 in the Saar, 18 in Aachen, and 7 in the Ibbenburen area.

Ruhrkohle AG was the FRG's largest coal company, owned by the major steelmaker Peine-Salzgitter, 11%; Thyssen, Krupp Stahl, Hoesch Werke, and Klöckner Werke together held 24%. The company produced about 72% of total coal output, employing about 122,000 workers.

Over 90% of lignite was produced by Rheinische Braunkohlenwerke AG, all from open-surface mines. Proven lignite deposits were estimated at 56 billion tons, 55 billion of which was located in the Cologne, Aachen, and Dusseldorf areas of the Ruhr. Almost 85% of production was destined for the generation of electricity. For the last 25 years, gigantic bucket wheel excavators, with a daily capacity of 110,000 cubic meters, were used by the company. In 1976, a 200,000-cubic-meter bucket wheel excavator was introduced at the Fortuna-Garsdorf surface mine; in 1978, a 240,000-cubic-meter excavator and a stacker began to be installed at the Hambach Mine, and in 1983, the Hambach area began to be mined, with reserves of 2.5 billion tons of lignite.

Natural Gas.—As production of natural gas over the long term has declined, FRG became even more dependent on the Soviet Union for imports. In 1982, shipments from the U.S.S.R. accounted for 23% of total FRG natural gas requirements. In 1983, FRG imported about 1,300 billion cubic feet of gas from the Netherlands, Norway, and the Soviet Union, a decline of 1.3% from that of 1982. Total imports, including transshipments, were 1,700 billion cubic feet. A contract was also negotiated with Denmark for future imports of 35 billion cubic feet of Danish offshore gas annually. Gas exports also fell, amounting to below 70 billion cubic feet excluding transshipments, 25.5% below the 1982 level.

Gas consumption in the FRG continued to decline for the third year, although gas distribution companies increased their earnings by 15%, or to about $1.4 billion.

Petroleum.—The FRG continued to import crude oil and petroleum products from the Soviet Union in increased quantities. In 1982, the FRG imported almost 8% of its domestic consumption from the U.S.S.R., valued at $5 million for crude oil and $3 million for petroleum products.

Falling demand, changing product mix, excess refining capacity, and depressed price levels resulted in a loss of over $10.00 on every ton of oil products sold. The FRG oil refining and marketing industry, Europe's largest, lost almost $6 billion between 1980 and 1983, a sum equivalent to the industry's total domestic investment. Because of the openness of the West German market, however, some 330 million barrels of products was imported in 1983, mostly from the Rotterdam area.

Despite the promising oil shows and several small wells, FRG offshore oil production remained insignificant. The only promising North Sea oilfield was the marginal Mittelplatte Field found by Texaco Inc.-Wintershall AG off the coast of Schleswig Holstein. FRG's only offshore oilfield under development was Schwedeneck in the Baltic Sea, 2.5 miles north of Kiel. The field had recoverable reserves of 55 million barrels.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted to U.S. dollars from the Deutsche mark (DM) at the rate of DM2.70=US$1.00 for 1983.

[3] The Economist. Down to Earth: A Survey of the West German Economy. Feb. 4, 1984, pp. 1-30.

[4] Metallgesellschaft AG. Annual Report 1982-83.

[5] Degussa AG. Annual Review 1982-83.

[6] DIW Wochenbericht (West Berlin). FRG Trade With CMEA Countries: Trade With Smaller CMEA Countries Reaches New Low. Mar. 24, 1984, pp. 163-170.

[7] Wirtschaftswoche. Rationalization Pressure May Ease. Apr. 6, 1984, pp. 12-15.

[8] Smith, M. Calcium Carbonate—Plastics and Paper To Grow? Ind. Miner. (London), No. 198, Mar. 11, 1984, p. 28.

[9] Gabel, R. Primarenergieverbrauch in der Bundesrepulik Deutschland 1983 Bleibt Auf dem Borjahresniveau. Gluckauf 120, No. 2, 1984, pp. 104-106.

The Mineral Industry of Ghana

By Ben A. Kornhauser[1]

Ghana's economy was still depressed owing to the continued world economic recession, the deterioration of its infrastructure and industrial plants, and a large deficiency in foreign exchange. Industrial production remained at a very small fraction of capacity.

The Volta Aluminum Co. (VALCO) of Ghana shut down completely in June 1983 because of the low water levels in the Volta Lake, which reduced the generated hydroelectric power. This curtailed hydroelectric power throughout the country. Insufficient crude oil for auxiliary power also prevented the operation of the new nodulizing manganese carbonate plant at Nsuta.

Efforts were underway to renovate the mines of the 100% Government-owned State Gold Mining Corp. (SGMC), particularly the two deep mines at Tarkwa and Prestea.

Through financing assistance from the International Development Association (IDA), an International Bank for Reconstruction and Development (World Bank) affiliate, Ghana planned to evaluate the petroleum potential of the country.

Despite severe measures taken by the Ghanaian Government in March, inflation continued in three digits and the economy did not improve. Industrial plants worked at 10% or 15% of their production capacity for lack of spare parts, equipment, and raw material owing to insufficient foreign exchange for their imports. The budget essentially was on a day-to-day basis, determined by the available revenue. Foreign debt was equivalent to the value of 2 years of exports.

The budget for fiscal year 1983 sought to impose surcharges ranging from 7.5 to 9.9 times the face value of the imported items, depending on the strategic importance of the import item to the economy. The import program for the fiscal year was estimated at $1.1 billion, a huge sum in Ghanaian currency. The heavy surcharge on imports severely impacted foreign trade. Under the present administration, the Government reduced borrowing from the Bank of Ghana, its central bank, by about 30%, thus slowing the inflationary process. For 1983, Ghanaian trade with the United States was an estimated $135 million in imports and $149 million in exports.[2] In October, the currency was devalued from an official rate of 2.75 cedis to the U.S. dollar. In August, the International Monetary Fund approved a loan of $377 million for Ghana to help ease the balance-of-payments difficulties caused by export shortfalls of gold on 1982 world markets.

PRODUCTION AND TRADE

Except for cocoa, which traditionally contributed 60% of the nation's export earnings and over one-half of total Government revenue, mineral production comprising gold, diamond, manganese, and bauxite remained the most important foreign exchange earner. Based on only 5 months of 1983 reporting by the Ghanaian Central Bureau of Statistics, the estimated mineral production index, which used 1977 as 100, decreased 9% from 55 in 1982. Estimated mineral production in 1983 saw gold and diamond decrease 8% and 56%, respectively; manganese increase 19%; and bauxite remained unchanged compared with that of 1982. Aluminum production fell 76% owing to the VALCO shutdown, while aluminum metal shipments dropped 72%.

Table 1.—Ghana: Production of mineral commodities[1]

Commodity[2]	1979	1980	1981[p]	1982[e]	1983[e]
Aluminum:					
Bauxite, gross weight metric tons	235,300	225,100	181,257	[r]63,500	63,500
Metal, smelter, primary do.	168,727	187,667	190,496	[r]174,246	42,453
Cement, hydraulic thousand metric tons	248	294	396	[r]292	290
Diamond:					
Gem[e] thousand carats	125	126	86	68	30
Industrial[e] do.	1,101	1,023	750	[r]616	270
Total do.	1,226	1,149	[e]836	684	300
Gold thousand troy ounces	[r]357	[r]353	341	[r]331	303
Iron and steel: Steel, crude[e] metric tons	5,000	5,000	5,400	5,400	5,400
Manganese ore and concentrate, gross weight do.	253,800	249,900	233,100	[r]159,900	190,000
Petroleum:					
Crude thousand 42-gallon barrels	556	650	NA	730	730
Refinery products:					
Gasoline do.	[e]2,200	[e]1,830	NA	NA	NA
Jet fuel do.	[e]300	[e]260			
Kerosine do.	[e]1,000	926			
Distillate fuel oil do.	[e]2,400	2,115			
Residual fuel oil do.	[e]2,000	NA			
Other do.	[e]130	NA			
Refinery fuel and losses do.	[e]390	NA			
Total do.	[e]8,420	[r] [e]8,500	NA	NA	NA
Salt[e] metric tons	50,000	50,000	50,000	50,000	50,000
Silver, mine output, metal content thousand troy ounces	20	[e]18	17	17	14

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through July 28, 1984.

[2] In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone) are produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

Table 2.—Ghana: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	Destinations, 1979	
		United States	Other (principal)
METALS			
Aluminum:			
Ore and concentrate	205,795	--	United Kingdom 174,063; Netherlands 31,732.
Metal including alloys, unwrought	107,194	51,442	Japan 29,988; U.S.S.R. 9,049; Hong Kong 6,051.
Copper: Metal including alloys, all forms	24	--	Upper Volta 21; Netherlands 3.
Manganese: Ore and concentrate, metallurgical-grade	222,733	--	Spain 85,651; Norway 43,296; Ireland 26,117.
NONMETALS			
Diamond: Industrial stones thousand carats	1,051	--	United Kingdom 555; Netherlands 200; Belgium-Luxembourg 126.
Salt and brine	4,129	--	Upper Volta 3,683; Niger 446.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Liquefied petroleum gas value, thousands	$238	--	Togo $99; Dahomey $76.
Residual fuel oil thousand 42-gallon barrels	1,094	262	Italy 673; Sweden 158.

[1] Table prepared by Virginia A. Woodson. Data available only for 1979.

Table 3.—Ghana: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	Sources, 1979	
		United States	Other (principal)
METALS			
Aluminum:			
Oxides and hydroxides	247,931	97,745	Australia 78,639; Jamaica 71,546.
Metal including alloys:			
Unwrought	69	61	Switzerland 5.
Semimanufactures	1,545	24	United Kingdom 1,237; Hong Kong 57.
Copper: Metal including alloys, semimanufactures	429	131	West Germany 251.
Iron and steel: Metal:			
Scrap	14,581	--	All from West Germany.
Pig iron, cast iron, related materials	2,628	306	Brazil 2,235; United Kingdom 86.
Ferroalloys:			
Ferromanganese	508	508	
Unspecified	20	--	All from West Germany.
Steel, primary forms	113	--	United Kingdom 93; Italy 20.
Semimanufactures:			
Bars, rods, angles, shapes, sections	63,763	1,959	Italy 56,677; United Kingdom 3,701.
Universals, plates, sheets	11,452	1,320	Japan 2,922; Netherlands 1,287.
Hoop and strip	1,095	13	United Kingdom 983; West Germany 89.
Rails and accessories	324	1	United Kingdom 322.
Wire	3,317	54	West Germany 1,076; United Kingdom 942.
Tubes, pipes, fittings	2,789	128	United Kingdom 1,003; France 682; Italy 559.
Castings and forgings, rough	506	305	United Kingdom 201.
Lead: Metal including alloys:			
Unwrought	113	--	United Kingdom 112.
Semimanufactures	240	--	Belgium-Luxembourg 223; United Kingdom 12.
Magnesium: Metal including alloys, all forms[2]	2,001	2,001	
Silver: Metal including alloys, unwrought and partly wrought[3] value	$4,270	--	All from West Germany.
Tin: Metal including alloys, semimanufactures	183	2	Netherlands 158; United Kingdom 12.
Zinc: Metal including alloys, semimanufactures	316	124	Belgium-Luxembourg 108; United Kingdom 49.
Other: Base metals including alloys, all forms	86	4	United Kingdom 82.
NONMETALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc. value	$2,087	--	United Kingdom $1,496; Italy $591.
Grinding and polishing wheels and stones	61	(4)	United Kingdom 25; India 13.
Asbestos, crude	3,556	--	All from Botswana.
Cement	288,902	--	Norway 173,758; France 35,348.
Chalk	19	--	United Kingdom 18; Switzerland 1.
Clays, crude	278	15	United Kingdom 263.
Diatomite and other infusorial earth value	$137,824	--	All from United Kingdom.
Fertilizer materials:			
Crude, n.e.s	148	--	West Germany 140.
Manufactured:			
Ammonia	151	--	United Kingdom 93; France 50.
Nitrogenous	30,159	--	United Kingdom 18,939; Netherlands 6,290; West Germany 4,930.
Unspecified and mixed	3,256	1,669	Japan 835; Netherlands 588.
Graphite, natural	1,544	1,544	
Gypsum and plaster	3,003	--	Spain 2,504; West Germany 449; United Kingdom 35.
Lime	5,121	--	United Kingdom 5,022.
Magnesite[5]	835	139	West Germany 696.
Mica:			
Crude including splittings and waste[6]	45	45	
Worked including agglomerated splittings	166	--	Italy 165.
Nitrates, crude	1,212	--	Norway 600; Belgium-Luxembourg 300.
Phosphates, crude	140	--	All from West Germany.
Pigments, mineral: Natural, crude	90	--	China 65; United Kingdom 20.
Pyrite, unroasted	435	--	West Germany 349; Belgium-Luxembourg 50.
Salt and brine	17	7	United Kingdom 8; Switzerland 2.
Sodium compounds, n.e.s.:			
Carbonate, natural and manufactured	308	9	West Germany 254; United Kingdom 39.
Sulfate, natural and manufactured	4,574	35	West Germany 3,117; China 330.
Stone, sand and gravel:			
Dimension stone, worked	7	1	United Kingdom 6.
Gravel and crushed rock	66	59	Italy 7.
Sand other than metal-bearing	328	323	United Kingdom 5.
Sulfur: Sulfuric acid	33	(4)	Belgium-Luxembourg 16; United Kingdom 14.
Talc, steatite, soapstone, pyrophyllite	141	--	France 100; China 36.
Other: Crude	388	372	United Kingdom 16.

See footnotes at end of table.

Table 3.—Ghana: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	Sources, 1979	
		United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	826	826	
Coal: Briquets of anthracite and bituminous coal	31	--	Italy 29; United Kingdom 2.
Petroleum:			
Crude ___ thousand 42-gallon barrels	3,758	--	Nigeria 2,615; Libya 583.
Refinery products:			
Gasoline, motor ___ do	22	--	Mainly from Italy.
Mineral jelly and wax ___ do	28	(4)	West Germany 27.
Distillate fuel oil ___ do	61	--	Ivory Coast 49; Italy 11.
Lubricants ___ do	131	42	United Kingdom 31; Ivory Coast 28.
Bitumen and other residues ___ do	359	--	West Germany 358.
Petroleum coke ___ do	676	655	Netherlands Antilles 19.
Unspecified ___ do	2	(4)	United Kingdom 1.

[1] Table prepared by Virginia A. Woodson. Data available only for 1979.
[2] May include beryllium.
[3] May include platinum-group metals.
[4] Less than 1/2 unit.
[5] May include dolomite.
[6] May include meerschaum, amber, and jet.

COMMODITY REVIEW

METALS

Aluminum.—Ghana's Volta River Authority (VRA) requested VALCO to shut its last two operating potlines, each rated at 44,000 tons per year, by the middle of June. Of VALCO'S five potlines, two had been shut in November 1982 and one in February 1983. The shutdown was requested because of low water levels at the Volta Lake, which supplied hydroelectric power to the smelter. The shutdown would continue in effect until the lake returned to normal levels, but this was not expected unless the rains were plentiful in the July to October 1984 rainy season.[3] In 1983, VALCO was owned 90% by Kaiser Aluminum & Chemical Corp. and 10% by Reynolds Metals Co.

By December, VRA had cut the electricity supplied to Togo and Benin by 35%. These measures were taken because the water level in the Volta Lake was 6 feet below the minimum needed to drive the turbines of the Akosombo and Kpong hydroelectric power stations. Only two of the six 127-megawatt turbines at Akosombo and only one of the four 40-megawatt units at the new Kpong plant downstream were operating.[4] The rainfall in 1983 had been lower than the previous annual average for 10 of the last 11 years.

Gold.—The Ghanaian Government included $20 million in the 1983 budget for the SGMC to renovate its mines, purchase spare parts for equipment, and recruit technicians. The World Bank also offered $35 million to rehabilitate SGMC mines, particularly the two deep production mines at Tarkwa and Prestea. France's Bureau de Recherches Géologiques et Minières performed a preliminary survey at Tarkwa and said that gold production could be increased from 2,400 troy ounces to 4,800 to 5,400 troy ounces per year within 2 to 3 years at a cost of $11 million to $13.8 million. Investment would be centered on mechanized underground operations, modernized washing methods, and improved management.[5]

Greenwich Resources Inc., a Vancouver, Canada, mining group, through its wholly owned subsidiary, Minex Developments PLC of Greenwich, United Kingdom, entered an agreement with private Ghanaian partners, West African Mining Co. and Ghana Ltd., to prospect for alluvial gold at Akim-Aspinamang, an area within 120 kilometers of Accra. Past geological surveys indicated that the Atiwa Range contained considerable gold ore. Minex Developments was to spend $71,000 for exploration and $356,000 for testing.[6]

Manganese.—The state-owned Ghana National Manganese Corp., at Nsuta in the Western Region, was to be rehabilitated and modernized with a 25-year loan for $5.2 million from the European Economic Community. New machinery and equipment would be bought to upgrade the facilities and to restore production to former levels.[7] Union Carbide Corp. sold its interests to the Ghanaian Government in 1975. The newly completed nodulizing plant to treat manganese carbonate ore was unable to operate because of the reduced hydroelectric power and insufficient crude oil to run the plant. The plant was designed to produce 300,000 tons of manganese dioxide nodules annually from 500,000 tons of feed.

NONMETALS

Ghana continued to import almost as much cement as it produced. The Ciments de l'Afrique de l'Ouest was to receive a $32.7 million loan to implement a $34.8 million program to place the company on a sound operational and financial basis. The clinker producer was to receive technical assistance, equipment, spare parts, money for fuel oil, and working capital. The approved funding was to come from the IDA, $9.3 million; the Caisse Centrale de Cooperation Économique, $12.8 million; the European Investment Bank, $7 million; and Compagnie Française d'Assurance pour le Commerce Extérieur, $3.6 million. The estimated completion date was June 1986.[8]

MINERAL FUELS

IDA contributed an $11 million credit to a $12 million countrywide assessment of Ghana's petroleum prospects. IDA's credit is for 50 years, including a 10-year grace period. Under the project, Ghana would conduct seismic surveys in promising areas and evaluate the data in conjunction with previous surveys and acquired data. Data to be studied would include those of Tano, Central, and Keta offshore areas. In November, surveys were started by Geophysical Services Inc.

The Petroleum (Exploration and Production) Law of October 1, 1983, declared all petroleum that existed in its natural state within the country as the property of the state. The Ghana National Petroleum Corp. was set up by the Government to explore, develop, and produce in areas not covered by agreement between it and other companies and to have participation rights as an equity holder in any oil discoveries.

Petro-Canada International Assistance Corp. approved the drilling of two wells in the South Tano structure at a cost of $23 million.[9] The Ghanaian subsidiary of Texas Pacific Corp. was committed to drill one wildcat well during the year on its 781,440-acre license off the Keta Basin Lagoon. The Phillips Petroleum Co. of Ghana, operator for a group that included Azienda Generali Italiana Petroli S.p.A. and Getty Oil International Ghana Inc., gave up some acreage surrounding the 1-X South Tano offshore oil and gas discovery that was made in 1978. At the time of discovery, the well produced 1,475 barrels per day of 32° gravity crude and 8.2 million cubic feet per day of gas from a depth of 12,000 feet in 310 feet of water. Only gas was found in subsequent appraisal work.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Ghanaian cedi (C) to U.S. dollars at the rate of C1=US$0.36. In October, the cedi was devalued so that C1=US$0.03. Since the official exchange rate before October did not reflect the true value of the Ghanaian currency, the current value must be viewed cautiously.

[3] American Metal Market. V. 91, No. 111, June 8, 1983, p. 4.

[4] Financial Times. Nos. 29 and 192, Dec. 9, 1983, p. 4.

[5] Engineering and Mining Journal. V. 184, No. 6, June 1983, p. 129.

[6] Accra People's Daily Graphic. Nov. 18, 1983, pp. 1, 5.

[7] London West Africa. No. 3460, Dec. 5, 1983, p. 2833.

[8] The World Bank. (Washington, DC). Annual Report, 1983. P. 119.

[9] London West Africa. No. 3455, Oct. 31, 1983, p. 2524.

The Mineral Industry of Greece

By Walter G. Steblez[1]

In 1983, the performance of the Greek economy showed little improvement over that of 1982. The economy was marked by high inflation, a decline in export earnings, and low investment. The gross national product did not show appreciable growth, and industrial production reportedly declined by an estimated 0.75% compared with that of 1982.

Major events in Greece's mineral industry during the year included the preliminary approval for the construction of an alumina plant with Soviet assistance, the startup of ferrochrome production at Tsigeli, and the planned construction of a lead-zinc metallurgical complex at Amphipolis. In the energy sector, construction approval was granted for a number of lignite coal facilities. The overall performance of the country's mineral industries indicated a marked degree of stagnation owing, in part, to the private sector's uncertainty over Government policies in respect to the status of privately owned industries.

Government Policies and Programs.—The main policy of the Pan-Hellenic Socialist Movement government appeared to be the nationalization and/or socialization of the Greek mineral industry by all statutory and administrative means available to the state.

The Government's full control of major banks and its intervention in the market permitted control of management of a large number of firms. A tight credit squeeze, coupled with price controls, high tax and wage increases, and layoff restrictions, resulted in sharp profit declines, making normal operations by many companies difficult. By applying law 1385/83, which established supervisory councils in the mining industry, and "The Ailing Enterprises Law," 1386/83, "ailing" companies in the private sectors were to be "rehabilitated" by state acquisition by means of converting outstanding loans from state-owned banks into Government-controlled equity shares in the company. In this manner, the Scalistiris Group, Greece's largest producer of magnesite and refractories, was rehabilitated in November 1983. The Heracles General Cement Co., which was financially sound and one of the largest cement exporters in the European Economic Community (EEC), was taken over by the state after controversial allegations of improper financial management.

The Greek Government's acquisition of Heracles General Cement and the Scalistiris Group followed the nationalization of the Compagnie Française des Mines du Laurium S.A.F., a lead producer, and Larco S.A., the country's only nickel producer, in 1981-82.

Late in the year, Greece's Ministry of Energy and Natural Resources drafted a law altering the terms of grants of exclusive prospecting and mining rights for nickel, lead, zinc, gold, and chromium deposits. Mining rights of private interests would be reduced to 75 years from the current 100 years with the added condition of payment of special fees to local authorities and on the further condition that private operators must prospect to determine total reserves without reference to their intended operations. The state would be allowed to pursue prospecting on existing privately held concessions.

Greece's Institute of Geological and Mining Research (IGMR) proposed an extensive Government mineral exploration program as part of the 5-year economic development plan (1983-87), with special emphasis on copper, mixed sulfides, chromite, manganese, gold, and rare earths. Exploration was also proposed for industrial minerals such as feldspar, clays, perlite, bentonite, pumice, and marble. Apart from the IGMR proposal, the 5-year development program provided for additional exploration for fossil fuels as well as for additional research on beneficiation and ore dressing technology, especially in regard to the treatment of phosphate ores from Epirus.

PRODUCTION

Reportedly, for the 9-month, January-September period, the ore production index declined by 6.5% compared with the same period in 1982. This was influenced by the downward trend in quarrying and in the mining of bauxite, magnesium, chromium, manganese, lignite, etc. The production of gas and electricity for the same period reportedly rose by 8.3%.

Table 1.—Greece: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982^{e}	1983^{e}
METALS					
Aluminum:					
Bauxite, gross weight thousand tons	2,812	3,286	3,216	[3]2,853	2,800
Alumina, gross weight do.	495	494	490	[3]420	410
Metal:					
Primary	140,830	146,500	^{e}147,000	^{r}135,000	140,000
Secondary	6,500	7,116	7,000	7,000	7,500
Chromium: Chromite:					
Run-of-mine ore	86,843	^{r}77,611	^{e}80,000	80,000	85,000
Marketable products:					
Direct-shipping ore^{e}	10,000	8,000	8,000	8,000	7,000
Concentrate	34,767	^{r}33,614	^{e}34,600	34,000	33,000
Copper, mine output, metal content	--	^{e}100	100	--	--
Iron and steel:					
Iron ore and concentrate, nickeliferous:[4]					
Gross weight thousand tons	1,832	1,451	^{e}1,400	1,400	1,500
Iron content do.	788	624	^{e}600	610	650
Metal:					
Pig iron do.	328	^{r}303	350	^{r}300	300
Ferronickel	54,192	51,407	^{e}51,000	51,000	50,000
Steel, crude thousand tons	1,000	935	909	[3]910	920
Semimanufactures[5] do.	1,450	NA	NA	NA	NA
Lead:					
Mine output, metal content	21,700	20,504	^{e}21,000	21,000	21,000
Metal, refined:[6]					
Primary	^{r}22,074	^{r}15,626	^{r} ^{e}21,000	^{r}3,000	18,000
Secondary^{e}	6,000	4,000	4,000	^{r}1,000	4,000
Manganese, gross weight:					
Ore, crude	77,360	60,050	64,517	63,700	64,000
Concentrate	5,700	5,555	5,800	5,500	5,600
Nickel:					
Ni content of nickeliferous iron ore[7]	20,152	15,237	15,600	15,200	16,000
Ni content of alloys	^{e}18,900	13,880	12,700	12,500	13,000
Silver:					
Mine output, metal content thousand troy ounces	1,752	1,672	^{e}1,600	1,500	1,600
Metal content of alloys^{e} do.	500	NA	NA	NA	NA
Tin metal, secondary^{e}	30	45	45	40	40
Zinc:					
Mine output, metal content	23,200	27,100	27,000	22,000	24,000
Metal including secondary	--	300	NA	NA	NA
NONMETALS					
Abrasives, natural: Emery^{e}	9,300	9,300	9,300	9,300	10,000
Asbestos:^{e}					
Ore	NA	NA	^{r}2,000	^{r}10,000	2,000,000
Processed	--	--	--	([8])	35,000
Barite:					
Crude ore	109,344	98,529	115,768	116,000	116,000
Concentrate	48,007	48,200	47,014	47,000	46,000
Cement, hydraulic thousand tons	12,098	^{r}12,680	13,355	[3]6,912	8,000

See footnotes at end of table.

Table 1.—Greece: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[e]	1983[e]
NONMETALS —Continued					
Clays:					
Bentonite:					
Crude	495,176	501,878	311,947	312,000	300,000
Processed	373,304	362,013	185,627	186,000	180,000
Kaolin:					
Crude	32,803	42,546	[e]42,500	42,500	43,000
Processed	9,485	11,489	[e]11,000	11,000	12,000
Fluorspar, grade unspecified	360	400	292	300	300
Gypsum and anhydrite	604,299	[r]485,053	[e]500,000	500,000	500,000
Magnesite:					
Crude thousand tons	1,219	1,167	825	800	770
Dead-burned	392,489	397,962	274,939	270,000	250,000
Caustic-calcined	112,172	114,000	81,714	80,000	75,000
Nitrogen: N content of ammonia	287,000	226,000	255,000	[3]254,800	255,000
Perlite:					
Crude	279,660	278,912	253,780	245,000	300,000
Screened	[r]135,394	[r]198,150	131,750	[r]135,000	140,000
Pozzolan (Santorin earth) thousand tons	1,241	[r]1,460	1,482	1,500	1,500
Pumice	944	[r]928,535	620,585	625,000	625,000
Pyrites, gross weight	150,951	147,298	[e]147,000	147,000	144,000
Salt, all types thousand tons	[r]155	121	131	[r]132	133
Silica (probably silica sand)[e]	27,000	28,000	28,000	28,000	29,000
Sodium compounds:[e]					
Carbonate	7,610	[r]10,878	11,000	11,500	12,000
Sulfate	1,000	1,000	1,000	1,000	1,000
Stone: Marble cubic meters	NA	NA	250,000	NA	NA
Sulfur:					
S content of pyrites thousand tons	63	61	60	60	60
Byproduct of petroleum do	3	4	7	8	10
Talc and steatite	5,112	1,460	[e]1,400	1,500	1,600
MINERAL FUELS AND RELATED MATERIALS					
Coal including briquets:					
Lignite thousand tons	23,617	23,207	27,107	[3]26,843	30,300
Lignite briquets do	70	97	110	[3]108	120
Coke:					
Coke oven do	[e]310	[e]300	310	[3]306	300
Gashouse do	15	15	15	[3]16	15
Gas:					
Manufactured, gasworks[e] million cubic feet	10	12	12	12	15
Natural do	NA	NA	1,351	[3]4,416	5,000
Petroleum:					
Crude thousand 42-gallon barrels	--	--	1,538	[3]7,618	10,000
Refinery products:					
Gasoline do	10,812	9,690	13,277	[3]14,952	15,000
Jet fuel do	10,064	10,632	12,976	[3]13,504	13,500
Kerosine do	348	333	357	[3]332	330
Distillate fuel oil do	26,363	27,505	29,407	[3]29,479	30,000
Residual fuel oil do	46,679	41,772	45,841	[3]41,878	40,000
Lubricants do	756	535	618	[3]687	700
Other do	11,759	10,240	3,400	[3]3,349	3,400
Refinery fuel and losses do	5,852	4,060	3,465	[3]4,969	5,000
Total do	112,633	104,767	109,341	[3]109,150	107,930

[e] Estimated. [r] Revised. NA Not available.

[1] Table includes data available through June 1984.

[2] In addition to the commodities listed, a variety of other crude construction materials (clays, sand and gravel, and stone) is produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels. Cobalt is also produced and is included with "Nickel."

[3] Reported figure.

[4] Ni content is also reported under "Nickel."

[5] Black sheet, galvanized sheet, reinforcing bars, and wire only.

[6] Includes antimonial lead and hard lead.

[7] Also includes Co content.

[8] Revised to zero.

TRADE

Greece continued to show a decline in its trade balance. Import and export results, based on statistics for the first 9 months of 1983, showed declines of 8% and 4%, respectively. Foreign commercial relations were also dampened by an uncertain investment climate. This was due, in part, to the Greek Government's restrictions on the repatriation of capital and profits, a practice that allegedly ran counter to the EEC's regulations concerning liberalized financial flows. Set Government goals, and not borrower risk, also appeared to have been the main criterion for credit allocation.

During the year, significant negotiations and commercial arrangements occurred between Greece and member states of the Council for Mutual Economic Assistance (CMEA) in the field of minerals and fuels. These included the construction of nonferrous metal production facilities in Greece with CMEA assistance and the purchase of petroleum by Greece. A number of commercial agreements were also reached with North African states. Diversification of petroleum supply sources appeared to have been Greece's aim in an agreement reached with Libya during the year.

Table 2.—Greece: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate thousand tons	1,588	1,441	--	U.S.S.R. 566; Romania 511.
Oxides and hydroxides	159,000	130,000		All to Netherlands.
Metal including alloys:				
Unwrought	69,225	66,608	--	Italy 31,887; France 29,873.
Semimanufactures	26,705	29,129	156	Saudi Arabia 10,376; West Germany 5,770.
Chromium: Ore and concentrate	15,885	12,175	--	West Germany 5,200; United Kingdom 2,633.
Copper: Metal including alloys:				
Scrap	1,494	430	--	Belgium-Luxembourg 231; West Germany 118.
Unwrought	1	98	--	Belgium-Luxembourg 59; United Kingdom 21.
Semimanufactures	12,350	14,013	74	Libya 3,577; West Germany 2,366.
Iron and steel:				
Iron ore and concentrate, pyrite, roasted	14,500	14,300	--	All to Kenya.
Metal:				
Scrap	819	734	--	Italy 397; Netherlands 277.
Ferroalloys	49,350	19,852	--	West Germany 7,691; United Kingdom 7,642.
Steel, primary forms	3,142	31,387	--	Italy 31,383.
Semimanufactures:				
Bars, rods, angles, shapes, sections	189,725	111,558	--	U.S.S.R. 48,830; Egypt 21,356.
Universals, plates, sheets	45,509	107,091	11,370	Yugoslavia 62,937; Algeria 6,820.
Hoop and strip	10,898	15,062	--	Syria 7,449; Cyprus 2,668.
Rails and accessories	1	20	--	Italy 19.
Wire	2,337	1,084	--	Libya 340; Tunisia 314.
Tubes, pipes, fittings	124,987	94,833	46,514	U.S.S.R. 23,772; Libya 6,793.
Castings and forgings, rough	662	648	--	West Germany 380; Iraq 207.
Lead:				
Ore and concentrate	21,580	23,700	--	U.S.S.R. 14,800; Belgium-Luxembourg 7,500.
Metal including alloys, scrap	361	216	--	All to West Germany.
Manganese:				
Ore and concentrate, metallurgical-grade	1,500	300	--	All to Yugoslavia.
Oxides	9,238	11,355	2,070	Belgium-Luxembourg 3,179; West Germany 1,336.
Nickel: Metal including alloys:				
Scrap	393	43	--	All to Netherlands.
Unwrought	--	403	--	Do.
Semimanufactures	479	356	--	Netherlands 340.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$2,204	$688	--	France $617.

See footnote at end of table.

Table 2.—Greece: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Ore and concentrate	42,100	35,700	--	U.S.S.R. 12,700; France 8,500.
Metal including alloys:				
Scrap	398	1,262	--	West Germany 842; Italy 123.
Unwrought	2	133	--	All to West Germany.
Semimanufactures	44	39	--	Belgium-Luxembourg 38.
Other:				
Ores and concentrates	124,288	91,505	--	Romania 90,000.
Ashes and residues	60,849	50,233	--	Saudi Arabia 44,183.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	271,743	279,887	136,808	United Kingdom 90,175; West Germany 45,904.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$326	$281	$225	West Germany $56.
Grinding and polishing wheels and stones	35	38	--	France 10; Australia 9.
Asbestos, crude	--	992	--	Italy 224; Yugoslavia 207.
Barite and witherite	822	36,758	--	Saudi Arabia 17,500; Nigeria 9,000.
Cement thousand tons	5,996	6,372	--	Saudi Arabia 2,753; Egypt 1,891.
Chalk	631	796	--	Saudi Arabia 698.
Clays, crude	768,426	326,377	--	Canada 77,980; Italy 42,040.
Fertilizer materials:				
Crude, n.e.s	2,239	581	--	All to Saudi Arabia.
Manufactured:				
Potassic	18,800	4,500	--	All to Jordan.
Unspecified and mixed	40,553	20,002	--	Zambia 20,000.
Gypsum and plaster	162	15,150	--	Saudi Arabia 15,000.
Lime	234	541	--	Cameroon 533.
Magnesite	280,863	351,330	16,350	West Germany 76,161; Italy 56,760.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	37,249	36,635	235	Italy 9,157; West Germany 5,683.
Worked	57,937	83,246	--	Saudi Arabia 44,728; Kuwait 13,659.
Gravel and crushed rock	22,179	68,112	--	Libya 67,851.
Quartz and quartzite	2,129	4,850	--	All to Italy.
Sulfur:				
Elemental: Crude including native and byproduct	5,758	442	--	Cyprus 238; United Kingdom 126.
Sulfuric acid	32,839	16,593	--	Yugoslavia 9,500; Bulgaria 4,150.
Talc, steatite, soapstone, pyrophyllite	525	105	--	All to Belgium-Luxembourg.
Other:				
Crude	215,368	166,367	16,000	West Germany 63,375; France 27,558.
Slag and dross, not metal-bearing	4,228	5,463	--	Saudi Arabia 2,050; Israel 1,370.
MINERAL FUELS AND RELATED MATERIALS				
Coke and semicoke	320	40	--	All to Libya.
Peat including briquets and litter	337	989	--	All to Saudi Arabia.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	366	583	--	Italy 306; Lebanon 100.
Gasoline do.	197	2,326	526	Lebanon 552; Italy 391.
Kerosine and jet fuel do.	2,960	3,212	2,852	Cyprus 150; Egypt 77.
Distillate fuel oil do.	2,098	1,988	1,352	Italy 513.
Lubricants do.	143	210	2	Cuba 65; United Kingdom 58.
Residual fuel oil do.	3,021	4,073	149	Yugoslavia 1,508; Italy 993.

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[1] Table prepared by Jozef Plachy.

Table 3.—Greece: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	337	404	12	United Kingdom 100; Netherlands 90.
Metal including alloys:				
Unwrought	2,840	3,970	--	Egypt 1,248; Netherlands 1,002.
Semimanufactures	4,388	3,958	418	West Germany 959; Italy 734.
Chromium:				
Ore and concentrate	3,952	20	--	All from West Germany.
Oxides and hydroxides	112	122	--	West Germany 80; Italy 16.
Copper:				
Matte and speiss including cement copper	3,665	8,864	99	Belgium-Luxembourg 3,572; Zambia 2,456.
Metal including alloys:				
Scrap	1,909	2,129	--	Belgium-Luxembourg 1,250; Spain 399.
Unwrought	20,030	17,742	221	Chile 5,871; Zambia 5,246.
Semimanufactures	2,581	1,536	106	West Germany 465; Italy 324.
Iron and steel: Metal:				
Scrap	288,145	433,779	213,310	U.S.S.R. 180,544; Netherlands 15,021.
Pig iron, cast iron, related materials	16,572	14,425	51	U.S.S.R. 1,546; Bulgaria 866.
Ferroalloys:				
Ferromanganese	2,628	4,552	--	Portugal 2,096; India 800.
Unspecified	8,633	10,922	--	Portugal 6,605; France 1,849.
Steel, primary forms	208,435	321,671	10,841	France 46,579; Japan 42,632.
Semimanufactures:				
Bars, rods, angles, shapes, sections	194,848	198,473	16	West Germany 45,962; Italy 42,597.
Universals, plates, sheets	217,757	198,767	495	France 32,218; West Germany 28,104.
Hoop and strip	131,093	66,594	8	West Germany 26,872; France 11,248.
Rails and accessories	3,705	2,883	--	Austria 1,241; Bulgaria 415.
Wire	10,167	9,383	47	West Germany 3,193.
Tubes, pipes, fittings	40,413	33,001	20	West Germany 11,836; France 8,172.
Castings and forgings, rough	950	1,649	2	Belgium-Luxembourg 821; France 481.
Lead:				
Ore and concentrate	--	39	--	All from Italy.
Oxides	88	87	(2)	France 39; West Germany 21.
Metal including alloys, unwrought	6,059	18,719	1,725	Bulgaria 4,358; Morocco 3,008.
Magnesium: Metal including alloys, unwrought	303	581	--	France 340; Norway 241.
Manganese:				
Ore and concentrate, metallurgical-grade	5	25,157	--	Ivory Coast 18,250; Gabon 6,907.
Oxides	126	152	--	Belgium-Luxembourg 144.
Mercury 76-pound flasks	58	116	(2)	Turkey 58.
Nickel: Metal including alloys:				
Unwrought	41	153	55	Netherlands 65; Finland 23.
Semimanufactures	46	40	(2)	West Germany 10; United Kingdom 10.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$577	$464	$22	West Germany $316; Switzerland $122.
Silver: Metal including alloys, unwrought and partly wrought do	$4,464	$2,334	--	United Kingdom $1,182; Switzerland $483.
Tin: Metal including alloys:				
Unwrought	417	298	(2)	Malaysia 152; Bolivia 51.
Semimanufactures	19	20	(2)	West Germany 11; United Kingdom 7.
Titanium: Oxides	663	718	--	West Germany 555; France 89.
Zinc:				
Oxides	563	518	--	France 243; Netherlands 112.
Metal including alloys:				
Scrap	--	37	--	All from Netherlands.
Unwrought	18,330	14,248	150	Netherlands 3,585; Belgium-Luxembourg 2,736.
Semimanufactures	220	183	--	Belgium-Luxembourg 57; West Germany 37.
Other:				
Ores and concentrates	8,218	4,011	79	Italy 2,508; Australia 578.
Oxides and hydroxides	176	267	(2)	West Germany 151; Norway 35.
Ashes and residues	289	20	--	All from Cyprus.
Base metals including alloys, all forms	169	477	11	France 402; Belgium-Luxembourg 34.

See footnotes at end of table.

Table 3.—Greece: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	44	77	4	Italy 72.
Artificial: Corundum	407	357	(2)	West Germany 209; France 85.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$3,192	$2,227	$43	West Germany $1,490; Belgium-Luxembourg $263.
Grinding and polishing wheels and stones	387	416	1	Italy 194; West Germany 63.
Asbestos, crude	14,666	7,102	--	Canada 2,110; U.S.S.R. 1,630.
Barite and witherite	3,430	6,039	--	Italy 3,320; Ireland 2,650.
Boron materials:				
Crude natural borates	301	600	300	Netherlands 300.
Oxides and acids	218	94	--	Switzerland 50; Italy 25.
Cement	805	338	17	Italy 154; Denmark 102.
Chalk	518	578	--	France 484; Spain 41.
Clays, crude	79,531	52,246	414	United Kingdom 32,439.
Diatomite and other infusorial earth	1,063	559	53	Italy 178; West Germany 164.
Feldspar, fluorspar, related materials	13,299	8,824	--	Norway 3,334; Italy 2,112.
Fertilizer materials:				
Crude, n.e.s	403	10	--	All from France.
Manufactured:				
Ammonia	49,864	145,754	--	U.S.S.R. 86,585; Algeria 22,929.
Nitrogenous	65,456	174,255	--	Romania 60,345; Bulgaria 43,957.
Phosphatic	(2)	20	--	All from France.
Potassic	5,079	2,317	--	Belgium-Luxembourg 1,894.
Unspecified and mixed	929	4,274	333	West Germany 3,159.
Graphite, natural	379	252	--	Czechoslovakia 100; Austria 60.
Gypsum and plaster	1,244	988	--	Italy 595; West Germany 322.
Magnesite	275	395	2	Austria 221; West Germany 97.
Mica: Crude including splittings and waste	193	210	2	Austria 130; India 50.
Phosphates, crude	218,771	359,340	--	Senegal 130,843; Morocco 124,473.
Pigments, mineral: Iron oxides and hydroxides, processed	1,676	1,490	--	West Germany 1,168; Italy 112.
Pyrite, unroasted	46,582	112,799	--	Spain 90,369; Cyprus 10,655.
Salt and brine	26,226	23,959	1	Italy 21,583; Netherlands 2,051.
Sodium compounds, n.e.s.: Carbonate, manufactured	31,944	23,609	--	Bulgaria 6,813; Italy 6,306.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	2,657	1,793	--	Italy 689; Bulgaria 532.
Worked	407	341	--	Italy 230; Bulgaria 42.
Dolomite, chiefly refractory-grade	1,404	4,516	--	Italy 3,008; United Kingdom 1,307.
Gravel and crushed rock	1,254	604	--	Spain 288; France 98.
Quartz and quartzite	15	195	--	Italy 80; West Germany 70.
Sand other than metal-bearing	82,502	84,057	20	Belgium-Luxembourg 47,698; Bulgaria 29,109.
Sulfur:				
Elemental:				
Crude including native and byproduct	61,888	142,250	--	Poland 107,046; France 21,992.
Colloidal, precipitated, sublimed	102	58	--	West Germany 50.
Sulfuric acid	23	34	--	West Germany 20.
Talc, steatite, soapstone, pyrophyllite	1,601	1,612	5	Belgium-Luxembourg 455; India 293.
Other:				
Crude	1,025	984	60	Gabon 198; Congo 144; Italy 141.
Slag and dross, not metal-bearing	367,684	692,068	--	Italy 582,676; France 78,693.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	66	32	5	France 17; United Kingdom 10.
Carbon: Carbon black	4,263	6,004	3	Italy 911; West Germany 626.
Coal:				
Anthracite and bituminous	168,401	385,604	273,509	Poland 72,708; Republic of South Africa 33,282.
Briquets of anthracite and bituminous coal	100	80	--	All from Czechoslovakia.
Coke and semicoke	23,568	33,549	--	West Germany 14,988; Poland 5,996.
Peat including briquets and litter	3,775	5,861	--	U.S.S.R. 4,702; Netherlands 1,028.
Petroleum:				
Crude thousand 42-gallon barrels	65,711	85,340	--	Saudi Arabia 41,258; Libya 20,606.

See footnotes at end of table.

Table 3.—Greece: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	5	13	(2)	Italy 11.
Gasoline do	367	194	(2)	Italy 128; France 39.
Kerosine and jet fuel do	99	119	(2)	Italy 96; France 20.
Distillate fuel oil do	1,107	259	--	Albania 128; France 49.
Lubricants do	385	446	4	Netherlands 252; Italy 49.
Residual fuel oil do	251	303	--	Bulgaria 265; Italy 26.
Bitumen and other residues do	13	202	--	Albania 198.
Bituminous mixtures do	15	9	(2)	United Kingdom 7.
Petroleum coke do	676	357	356	United Kingdom 1.

[1] Table prepared by Jozef Plachy.

[2] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—Although Greece's bauxite production declined for the second straight year because of low demand, plans to expand mining operations at the Bauxites Parnasse Mining Co. S.A. remained current in anticipation of an agreement with the U.S.S.R. for the construction of a 600,000-ton-per-year alumina project at Itea.

A member of the Eliopoulos-Kyriacopoulos Group, Bauxites Parnasse was the largest privately owned bauxite producer in Europe with mining operations located in the Parnassos-Ghion Mountains, about 150 kilometers northwest of Athens. Annual production of high-grade bauxite had been about 1.5 million tons and would be increased to about 2.5 million tons if the alumina project were to be finalized. In the event of a final agreement, Bauxites Parnasse, which already had crushing and beneficiation facilities in the Itea port area, would form a partnership with the Greek Government in future alumina production.

Negotiations between the Greek Government and that of the U.S.S.R. continued through 1983 and resulted in letters of intent to construct the Itea plant upon resolution of specific details of the project. One of the outstanding issues at yearend was the buy-back price at which the alumina would be sold to the Soviet Union as compensation for Soviet investment of 55% of the $400 million deal. During the year, Bulgaria restated its intent to purchase 200,000 tons of alumina per year within the framework of the Soviet-Greek arrangement. Inconclusive negotiations were also conducted with Hungary concerning possible Hungarian purchases of Greek alumina.

Events in Greece's aluminum smelting sector had mixed results. Production improved in comparison with that of 1982, but difficulties arose in a dispute between Aluminium de Grèce S.A. (AG), a subsidiary of the French Pechiney Ugine Kuhlmann, and the publically owned Greek Public Power Corp. (PPC) over electric power rates. PPC, with the approval of the Greek courts, proposed an increase to 25 mills per kilowatt hour from the 15-mill rate contracted previously with AG. The old rate was claimed to be too low in view of the strong recovery of aluminum prices. AG claimed that the rate increase would undermine the competitive position of its alumina and aluminum operations, and the issue was submitted to Swiss legal arbitration at Lausanne for resolution.

Chromite.—The Ministry of Energy and Natural Resources reported that exploratory work conducted in 1982 by the IGMR in the vicinity of Vourinos, in Kozáni, succeeded in locating new chromite deposits of a higher-than-anticipated quality and have raised the proven reserves in the Vourinos area to 1 million tons. The ore would be supplied to the new 30,000-ton-per-year ferrochrome plant at Volos. Further exploration efforts were to be conducted during the year to secure sufficient chromite deposits for at least a 20-year operation at the Volos plant at a future 40,000-ton-per-year output level.

The ferrochromium plant at Tsigeli, near Volos, was completed and put in operation by midyear. Owned by Hellenic Ferroalloys S.A., a subsidiary of the state-owned Hellenic Industrial Mining & Investment Co. (HIMIC), the $65 million plant was constructed with technical and engineering assistance from Outokumpu Oy of Finland. Chromite for the plant was supplied by the HIMIC-owned Skoumtsa Mine, a fully mechanized 220,000-ton-per-year underground operation. Lenticular banded ore with an average Cr_2O_3 content of 17% to 20% was concentrated to 50% to 52% Cr_2O_3. Construction of another concentrator adding 60,000-ton-per-year capacity was completed by yearend. At full capacity, the entire installation will treat 250,000 tons of ore, but to a 48% Cr_2O_3 average grade.

Iron and Steel.—Hellenic Steel Co. completed its expansion program for the year with the startup of a new four-stand cold-rolling strip mill. A continuous temper mill, galvanizing and picking lines, and an annealing furnace were also reportedly put into operation.

Plans for a stainless steel plant near the Tsigeli ferrochromium plant at Volos were developed and reviewed by HIMIC. If constructed, the plant would consist of a 60,000-ton-per-year smelter and cold-rolling plant and would be supplied with domestically produced ferroalloys from the Tsigeli ferrochromium and Larco ferronickel facilities.

Reportedly, negotiations between the Greek company of E. Karakikolas Sa-Beky and the U.S.S.R. for the construction of a 130,000- to 150,000-ton stainless steel plant continued. The plant, if built, would produce bars and flat-rolled materials. The completion of a feasibility study was reported.

Lead and Zinc.—Mine expansion continued at the Olympias Mine of the Bodossakis Kassandra mines group with the development of a 400-meter shaft. Completion of the mine was expected in 1984. The other major event in the industry was the planned reopening of Greece's and perhaps Europe's oldest mining and metallurgical operation at Lavrion. The Compagnie Française des Mines du Laurium S.A.F., formerly controlled by the Peñarroya company of France, was to reopen as a worker cooperative under the name of Hellenic Mining and Metallurgical Co. of Laurium S.A. About 32,000 tons per year of lead concentrate from the Kassandra Mines in Khalkidiki would be supplied to the complex, which, in turn, would produce 19,000 tons per year of lead alloys, as well as smaller amounts of gold and bismuth.

Action by the Government-owned Aegean Metallurgical Industries S.A. on the proposed Strymon River lead-zinc mining and concentrating complex was temporarily suspended pending evaluation of responses from tender documents for the $350 million project that were sent to companies in Western Europe, the United States, and Japan.

Nickel.—Larco increased both production and exports during the year because of an improved world market. Reportedly, the company planned substantial investments for facility expansion and modernization.

The complaint lodged by Larco and other European nickel producers in 1982, alleging Soviet dumping, resulted in a 7% antidumping duty set by the EEC. In 1983, this decision was rescinded because past practices by other nickel exporters to the European market that were similar to those allegedly used by the U.S.S.R. were not protested before the EEC Commission.

NONMETALS

Asbestos.—Operations at the Asbestos Mines of Northern Greece S.A.'s Zidani mining complex significantly improved compared with those of 1982. Two million tons of crude ore was mined and 35,000 tons of fiber was produced. Approximately 19,000 tons of product was exported. Reportedly, the Zidani mining operation still was experiencing technical difficulties, which resulted in fiber losses during processing. Plans for 1984 called for technical improvements and a fiber production increase to 55,000 tons, which would still be about 45,000 tons below designed capacity.

Cement.—The Greek cement industry continued to achieve high production in 1983. With a total capacity of about 17 million tons per year, the country's four producers not only met domestic needs but were also able to increase exports at a time when the European cement industry, as a whole, experienced a production decline.

Because of alleged financial impropriety, the Greek Government took over the management of Heracles General Cement at yearend. The company was the largest cement producer in Greece, with about 43% of the total domestic production capacity.

Magnesite.—The Scalistiris Group, which produced about 90% of Greece's deadburned magnesite as well as refractories and other industrial materials, was taken over by the Government to prevent financial collapse. At issue was a debt of about $112 million to the state-controlled National Bank of Greece, the Social Insurance Foundation, the PPC, and other creditors, which Scalistiris could not pay on schedule. The company's magnesite was exported mainly to Bulgaria, France, the Federal Republic of Germany, Romania, and Sweden.

Phosphate.—A study conducted by IGMR and HIMIC on the planned exploitation of the 10-million-ton phosphate deposits in Epirus in northern Greece forecast an eventual ore dressing operation that would produce 200,000 tons of concentrates per year with 26% to 28% P_2O_5. The study was conducted with the assistance of Jacobs Engineering Inc. of California and Zellars Williams Inc. of Florida, at a cost of $12 million. Eventual production would be consumed domestically.

MINERAL FUELS

Lignite.—Greece continued to increase its reliance on domestic energy resources. The production of lignite increased by 3.5 million tons in 1983 over that of 1982, and was planned for a further 4-million-ton increase in 1984. Development of the Amynteo Mine at Ptolemaïs continued during 1983, and talks were held with Czechoslovakia for the possible construction of a lignite gasification unit in the Ptolemaïs area.

Petroleum and Natural Gas.—Esso Pappas' assets were purchased by the Greek Government for $15 million. It was reported that Government plans included expansion at the newly acquired facility as well as the state-owned Aspropyrgos refinery. Domestic exploration resulted in new discoveries at Zakinthos Island and in the offshore Thásos-Kaválla area. Reportedly, in the latter, the heavy petroleum deposit was found not to be commercially feasible.

In July, a Soviet trade delegation visited Athens and held preliminary discussions with the Greek Government regarding the possible supply of natural gas to Greece.

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[1] Foreign mineral specialist, Division of Foreign Data.

The Mineral Industry of Guinea

By John R. Lewis[1]

The mining and mineral industry of Guinea continued to contribute almost one-fourth of the country's gross domestic product in 1983. Bauxite and alumina exports were on the rise and provided nearly all of Guinea's foreign exchange. With development of the Association pour la Rècherche et l'Exploitation du Diamont et de l'Or (Aredor) diamond mine, which was almost completed by yearend, new foreign exchange earnings were to be expected. Development of the Mifergui high-grade iron ore deposits and of uranium and petroleum resources were in initial stages.

PRODUCTION AND TRADE

Production and export of bauxite and alumina, Guinea's two largest mineral resources, reversed the downward trend of 1981 and 1982 and increased to about par with the output of 1981. By 1983, there were approximately 600 registered Guinean diamond mine concessionaires, called masters who sold their diamonds at an annual auction. Total recorded production under this arrangement was showing some slight increase.

Guinea was entirely dependent on other countries for petroleum products. The United States, Western Europe, and the U.S.S.R. furnished the bulk of the general mix of products—diesel oil, kerosine, motor and aviation gasoline, residual fuels, and lubricants—about 76 million gallons in all during 1983.

Table 1.—Guinea: Production of mineral commodities[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
Aluminum:					
Bauxite:					
Mine production:					
Wet basis	14,653	13,427	12,833	11,827	13,591
Dry basis[3]	13,334	12,219	11,678	10,446	12,380
Shipments (dry basis):					
Metallurgical-grade bauxite	10,055	10,330	9,792	9,701	10,000
Calcined bauxite	--	111	98	98	100
Alumina:					
Production	662	708	679	549	578
Shipments	662	708	608	549	578
Diamond:					
Gem[e] thousand carats	27	12	12	10	23
Industrial[e] do	58	26	26	23	17
Total do	[e]85	38	38	33	40

[e]Estimated. [p]Preliminary.

[1] Includes data available through July 1984.

[2] In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, stone, and sand and gravel) presumably are produced, but output is not reported quantitatively and available information is inadequate to make reliable estimates of output levels.

[3] Calculated, assuming 9% average moisture.

Table 2.—Guinea: Apparent exports of bauxite and alumina, by country[1]

(Metric tons)

Country	Bauxite		Alumina	
	1981	1982	1981	1982
Austria	22,099	16,884	--	
Canada	661,246	762,663	--	--
Finland	--	1,000	--	--
France	1,544,177	820,548	--	47,565
Germany, Federal Republic of	1,379,144	791,114	48,236	60,027
Iceland	--	--	23,570	58,804
Italy	365,824	191,324	--	5,710
Netherlands	--	303	--	--
Spain	722,116	816,439	77,914	--
Sweden	--	--	23,020	--
Switzerland	--	--	--	3,747
U.S.S.R.[2]	[r]1,714,000	2,387,000	--	--
United Kingdom	19,597	78,157	--	--
United States	3,545,681	4,197,933	--	--
Yugoslavia	323,146	138,667	57,429	31,624
Total	[r]10,297,030	10,202,032	230,169	207,477

[r]Revised.

[1] Table prepared by Margaret Chauncey. Owing to a lack of official trade data published by the Government of Guinea, this table should not be taken as a complete presentation of Guinea's exports of bauxite and alumina. These data were gathered from various sources that include United Nations information and official trade data published by the partner trading countries. Table includes data available through Aug. 24, 1984.

[2] Metal Statistics 1972-82. Metallgesellschaft Aktiengesellschaft. 1983, Frankfurt am Main, Federal Republic of Germany.

COMMODITY REVIEW

METALS

Bauxite and Alumina.—Strengthened demand for aluminum in the United States, Canada, and Western Europe resulted in improved shipments of bauxite and alumina from the Sangaredi and Friguia mining complexes, two of Guinea's three operating bauxite developments. This was favorably affecting Guinea's hard currency revenues. Bauxite mining and alumina processing continued to be Guinea's most productive single sector, and accounted for 90% to 95% of the country's export earnings.

The bauxite reserves of Guinea are more than 7 billion tons, far larger than those of any other nation. Several deposits have been delineated but exploitation is still in the future. Bauxite deposits are centered around four geographic areas. Reserves of each such grouping are shown in the following table:[2]

Area	1983 reserves (million tons)	Ore grade (percent Al_2O_3)
Sangaredi	120	60
	300	50
Aye Koye[1]	1,100	49
	2,900	44-45
Friguia	110	40-43
Kindia	75	45-48
Touge	500	45-50
Dabola[1]	2,000	45

[1]Exploitation had not begun by 1983.

The Sangaredi complex was held by Compagnie des Bauxites de Guinée, which was owned 49% by the Government of Guinea and 51% by a consortium of North American and West European companies. The Canadian firm, Aluminum Co. of Canada Ltd., was the operator. The Friguia mines were owned 49% by the Government and 51% by Frialco Co., a consortium of Canadian, British, and West European companies. Péchiney Ugine Kuhlmann of France was the operator for the consortium. The Kindia bauxite deposits were owned solely by the Government of Guinea and operated by the Office des Bauxite de Kindia, with most of the production going to the U.S.S.R., Bulgaria, Romania, and Yugoslavia. During 1983, purchases by these countries were drastically curtailed, and the Government was seeking other buyers.

Guinea produced 12.4 million dry tons of bauxite. Output by complex was Sangaredi, 8.5 million tons; Friguia, 1.1 million tons; and Kindia, 2.7 million tons.

Three additional extensive bauxite deposits in Guinea continued to attract varying amounts of interest from potential developers. At Aye Koye, an operating consortium of Guinean, Algerian, Nigerian, Romanian, and Yugoslavian interests were marking time until world aluminum markets were more steady. In connection with the Aye Koye project, a feasibility study on a massive hydroelectric dam and plant at Konkoure, plus an aluminum smelter, was completed by Swiss Aluminium Ltd. Long distances to tidewater and lack of infrastructure were identified as reasons for suspension of any work on two other large bauxite areas, Dabola and Touge.

Gold.—Early in 1983, Chevaning Mining Co., registered in the United States, was formed to explore a 40,000-square-kilometer concession granted by the Government of Guinea for 5 years. The tract was in the Siguiri-Mandia regions, which were said to possess some of Guinea's richest alluvial precious metal deposits.

Plans by the Norwegian Torvald Klaveness Group were firmed late in the year to start up a placer gold project in Guinea early in 1984.

Iron Ore.—The Mifergui-Nimba iron ore mining project in southeastern Guinea, close to the Liberian border, remained in the planning stage during 1983 while the Guinean Government sought financing for the \$1 to \$1.5 billion[3] project and worked to solve technical and transport problems. The Government held a 50% interest in the operation while other governments or companies, called B Partners, held the other 50%, with Nigeria holding the largest share. The participants were Nigerian Ministry of Mines and Power, represented by the Associated Ores Mining Co.; Libyan Arab Foreign Investment Co.; Société Nationale de Recherches et d'Exploitations Minières of Algeria; Instituto Nacional de Industria, Spain; Matalurski Kombinat Smerderevo of Yugoslavia; Mineralimport-export, Romania; Japan Mifergui Corp.; Société Lorraine et Méridionale de Laminage Continu, France; Union Sidérurgique du Nord et de l'Est de la France; National Investment Commission, Liberia; and the United States Steel Corp., which held engineering and project management contracts. Initial production would be about 15 million tons per year. Financing from the European Economic Community was being sought, but a condition of such assistance was likely to be the scaling-down of the project to 5 million tons per year. Current world supply and market conditions were indicated to be factors.

NONMETALS

Diamond.—Guinea's Aredor diamond project was nearing startup as 1983 ended. The open pit diamond operation was to operate as Aredor Guinée Inc., which was owned 50% by the Government and 50% by Australian Bridge Oil Ltd., with the International Finance Corp., a subsidiary of the International Bank for Reconstruction and Development (World Bank); Simonius Vischer of Basel, Switzerland; Bankers Trust Co. of the United States; and Industrial Diamond Co. of the United Kingdom as nonparticipating minority partners. Full-scale production was planned for April 1984.

The Aredor complex comprised a main recovery facility containing a heavy-medium-separation section, a washing section, a feed section, and a separator house. The plant was located at Kerouane, 110 kilometers via road from Kissidougou in Haut Guinea and close to the Sierra Leone border, where established alluvial diamond mining operations, based on similar deposits, had been underway for a number of years. Aredor was using a fleet of eight 40-ton articulated trucks to haul equipment and supplies to the minesite on a round-the-clock basis. Some $2.2 million had been spent to improve the 110-kilometer road from Kissidougou, which itself is located 750 kilometers from Conakry, the capital and only major seaport of Guinea. Three Manitowoc 7-cubic-yard draglines with 140-foot booms, purchased at a cost of $3.5 million, had been assembled on the site and were clearing overburden in December 1983. Indications were that development was running ahead of schedule and about $5 million below budget as startup neared. Production was expected to reach 250,000 to 300,000 carats during the first year of operation and peak at 500,000 carats during the second year. Fine gold dust, also present in the alluvial gravels, was to be captured to help defray costs.

MINERAL FUELS

Petroleum.—Seismic tests in Guinea's offshore exclusive economic zone in 1982 prompted Union Texas Oil Co., which was owned 75% by the Superior Oil Co. of the United States, to join the Government of Guinea in a 50-50 partnership for offshore petroleum exploration and drilling during 1983. A test well drilling program was apparently postponed until resolution of a maritime border dispute between Guinea and Guinea-Bissau. A second offshore concession was awarded to Bridge Oil of Australia, one of the partners in the diamond mining venture.

Uranium.—An aerial geophysical survey of the area around Conakry indicated the possibility of a uranium ore body. The international consortium established in 1982 placed the Anglo-American investing partner Davy McKee Corp. in charge of exploration activities in most of southeastern Guinea during 1983. Guinea retained a 50% share of the joint venture.

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[1] Physical scientist, Division of Foreign Data.

[2] Schmid, F. Geology of Recent/Potential Bauxite Producing Areas in Sierra Leone and in the People's Revolutionary Republic of Guinea (West Africa). Paper in Bauxite—Proceedings of the 1984 Bauxite Symposium (SME-AIME annu. meeting, Los Angeles, CA, Feb. 27-Mar. 1, 1984). Soc. Min. Eng. AIME, 1984, pp. 486-499.

[3] Where necessary, values have been converted from Guinean syli (GS) to U.S. dollars at the rate of GS23.314=US$1.00.

The Mineral Industry of Hungary

By Walter G. Steblez[1]

Overall, the modest targets set for Hungary's centrally planned economy were met. National income rose 0.5% and industrial production increased by 1% in 1983. However, both gross production and productivity of Hungary's minerals sector declined by 3.2% and 3.3%, respectively, compared with those of 1982. In production of metals, there was a reported 2.5% drop, but at the same time, a 2.2% increase in productivity was reported. The production drop in the minerals sector was, in part, attributed to a planned reduction of industrial energy consumption. The production of coal alone was about 1 million tons less than in 1982. In steel, the production drop followed a reportedly substantial decline in personnel, as an increasing number of workers left their traditional employment for more lucrative jobs elsewhere. Approximately 500 miners sought other employment because wages increased only 2.7%, compared with a 4.6% increase for industry as a whole.

Rather than having initiated major investment projects in 1983, work continued on the installation of converter technology at two major steelworks. Also, mine development continued at the Markushegy, Nagyeghaza, Many, and other coal mines. Although the country's mining sector was reportedly able to meet most goals, miners had to work overtime on weekend and holiday shifts. Some miners were reported to have reached the extreme limit for physical and psychological well-being.

Government Policies and Programs.—Centrally planned Government policy continued to emphasize increasing efficiency of raw material and energy consumption to achieve cost reductions. Industrial production was planned to increase between 1.5% and 2% in 1984. Planned domestic production levels of fuels and other raw materials would remain at about the same levels as in 1983. The 1984 plan did not call for increased imports of energy, with the exception of electric power. The plan also set a 3.5% wage increase in the mining industry. Also, the foreign trade plan called for expanded exports of metals, mainly special steel products.

PRODUCTION

Hungary's centrally planned mineral industry maintained production levels in 1983 comparable with those of 1982. Increases, however, were possible in the bauxite mining and aluminum producing sector because of increased hard currency sales.

Production of mineral commodities was not pursued at all costs, as is commonly the practice in centrally controlled economies, but was to be brought in-line with real market demand. At issue, however, were the high subsidy levels within the mining sector, whose chief aim was to reduce import dependence on raw materials and energy, as opposed to the market-oriented processing and fabricating industries, which were concerned about competitiveness in the world market. Hungarian economists and planning authorities have not yet successfully resolved this contradiction.

Table 1.—Hungary: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum:					
Bauxite, gross weight thousand tons	2,976	2,950	2,914	2,627	[3]2,917
Alumina, gross weight do.	788	805	792	710	[3]836
Metal, primary	71,879	73,498	74,253	74,221	[3]74,039
Copper:					
Mine output, metal content[e]	100	--	--	--	--
Metal:[e]					
Smelter, secondary	100	100	100	100	100
Refined including secondary	12,000	12,000	12,000	12,000	12,000
Gold, mine output, metal content[e] thousand troy ounces	60	60	60	50	30
Iron and steel:					
Iron ore:					
Gross weight thousand tons	532	426	422	467	[3]441
Iron content do.	121	90	88	101	95
Metal:					
Pig iron:					
For steel industry do.	2,262	2,094	2,065	2,065	[3]1,966
For foundry use do.	107	120	128	116	81
Total do.	2,369	2,214	2,193	2,181	2,047
Ferroalloys:					
Ferrosilicon	7,726	10,390	[e]10,500	10,500	10,000
Silicon metal[e]	2,000	2,000	2,000	2,000	2,000
Other[e]	4,300	2,400	2,500	2,500	2,000
Total	[r]14,026	[r]14,790	15,000	15,000	14,000
Steel, crude thousand tons	3,908	3,764	3,642	3,702	3,617
Semimanufactures, rolled only do.	3,240	3,043	2,816	2,853	2,820
Lead:[e]					
Mine output, metal content	1,000	1,100	1,000	1,000	1,000
Metal, refined, secondary	100	100	100	100	100
Manganese ore:					
Run of mine[4]	130,871	134,472	121,965	150,035	150,000
Concentrate	83,000	83,000	71,000	83,000	82,000
Silver, mine output, metal content[e] thousand troy ounces	32	([5])	([5])	([5])	--
Zinc:[e]					
Mine output, metal content	2,600	2,800	2,000	2,000	2,000
Metal, smelter, secondary	600	600	600	600	600
NONMETALS					
Cement, hydraulic thousand tons	4,857	4,660	4,635	4,369	[3]4,243
Clays:					
Bentonite:					
Raw	72,488	77,685	80,531	84,934	85,000
Procesed	48,140	51,061	52,515	54,014	55,000
Kaolin:					
Raw	63,457	51,839	52,518	45,131	46,000
Processed	7,300	7,067	7,024	7,109	7,200
Lime, calcined thousand tons	714	698	757	845	[3]802
Nitrogen: N content of ammonia do.	803	795	818	792	800
Perlite	97,895	99,270	95,190	89,975	90,000
Pyrites, gross weight[e]	7,000	7,000	7,000	7,000	7,000
Refractory materials, n.e.s.:					
Chamotte products thousand tons	164	164	164	164	164
Chrome magnesite products do.	46	41	40	40	40
Sand and gravel:					
Gravel thousand cubic meters	13,254	11,634	12,191	11,219	11,500
Sand:					
Common do.	415	406	400	400	400
Foundry thousand tons	818	496	692	585	600
Sodium sulfate[e]	11,000	11,000	11,000	11,000	11,000
Stone:					
Dimension, all types thousand tons	[r]3	1	1	1	1
Dolomite do.	1,304	1,220	1,248	1,324	1,300
Limestone do.	8,563	8,415	8,565	8,367	8,300
Quartzite do.	31	43	33	26	25
Sulfur:					
From pyrite[e]	3,000	3,000	3,000	3,000	3,000
Byproduct, elemental, all sources	9,412	9,293	[e]9,200	9,200	9,200
Total	12,412	12,293	[e]12,200	12,200	12,200
Sulfuric acid	587,948	589,838	573,240	575,000	580,000
Talc[e]	17,500	17,500	17,500	17,000	17,000

See footnotes at end of table.

Table 1.—Hungary: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[e]	5,000	5,000	5,000	5,000	5,000
Coal:					
Bituminous thousand tons	3,002	3,056	3,066	3,039	[3]2,827
Brown do.	14,182	14,157	14,463	14,754	[3]14,406
Lignite do.	8,475	8,479	8,413	8,286	[3]7,980
Total do.	25,659	25,692	25,942	26,079	[3]25,213
Coke:					
Coke oven:					
Metallurgical do.	651	673	645	618	[3]564
Other[e] do.	170	170	170	170	170
Total do.	821	843	815	788	734
Gashouse[e] do.	180	180	180	180	170
Total coke do.	1,001	1,023	995	968	904
Fuel briquets do.	1,251	1,250	1,338	1,472	[3]1,533
Gas:					
Manufactured million cubic feet	18,152	19,317	[e]18,000	[e]18,000	18,000
Natural, marketed do.	230,286	216,902	212,276	240,140	250,000
Natural gas liquids:					
Natural gasoline thousand 42-gallon barrels	3,834	3,791	[e]3,700	[e]3,700	3,800
Liquefied petroleum gas do.	3,480	[e]3,600	[e]3,500	[e]3,500	3,500
Peat, agricultural use[e] thousand tons	70	70	70	70	70
Petroleum:					
Crude:					
As reported do.	[r]2,200	2,031	2,024	2,027	[3]2,004
Converted thousand 42-gallon barrels	[r]16,405	[r]15,497	13,723	13,743	13,587
Refinery products:[6]					
Gasoline including naphtha do.	13,005	12,240	[e]12,000	[e]12,000	12,000
Kerosine and other light distillates[7] do.	5,968	6,960	[e]7,000	[e]7,000	7,000
Distillate fuel oil do.	29,571	27,207	26,297	25,163	25,000
Residual fuel oil do.	26,440	21,758	20,526	17,329	17,000
Lubricants do.	1,134	1,090	1,000	[e]1,000	1,000
Liquefied petroleum gas do.	1,160	[e]1,100	[e]1,000	[e]1,000	1,000
Asphalt and bitumen do.	3,951	3,927	[e]3,900	[e]3,900	3,800
Paraffin and petrolatum do.	220	251	[e]250	[e]250	250
Total do.	81,449	74,533	71,973	67,642	67,050

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through July 1984.

[2] In addition to the commodities listed, diatomite, gypsum, and a variety of other crude construction materials such as common clays are produced, but available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

[4] 18% to 20% Mn.

[5] Revised to zero.

[6] Excludes refinery fuel and losses.

[7] Data derived by subtracting reported motor gasoline and white spirit data from reported light refinery products total.

TRADE

Hungary, a member of the Council for Mutual Economic Assistance (CMEA), had to rely on imports to meet domestic needs for most raw materials. The U.S.S.R., Hungary's most important trade partner within CMEA, accounted for about 60% of Hungary's trade within the CMEA bloc and 34% of the total foreign trade. Compared with that of 1982, trade with the U.S.S.R. increased 16%. Major imports by Hungary consisted of raw materials and fuels in exchange for machine tools, equipment, and chemicals.

A major event in 1983 was the extension of the alumina-aluminum agreement with the U.S.S.R. through 1990, ensuring that the U.S.S.R. would continue to process Hungarian alumina. An agreement was also signed during the year for continued Soviet supplies of petroleum, which amounted to about 30% of total Hungarian imports from the U.S.S.R. During the year, trade relations were expanded with Greece and included new agreements for long-term purchases of alumina from Greece and long-term exports of stainless steel to that country.

Having become a member of the International Bank for Reconstruction and Development (World Bank) and the International Monetary Fund in mid-1982, in 1983, Hungary applied for two loans from the World Bank for domestic energy conservation and recovery projects.

Hungary and other CMEA-bloc countries had traditionally relied on Soviet deliveries to meet their raw material needs, but in recent years, increased Soviet domestic consumption, the growth of major minerals resources to the east of the Urals, and increased Soviet sales to the hard currency world market forced CMEA-bloc members to rely increasingly on supplies from developing countries outside the bloc. To date, Hungary's mineral activity in the developing countries ranks third among CMEA members.

Table 2.—Hungary: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982^{P}	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate[2]	498,322	467,375	--	Czechoslovakia 305,015; East Germany 140,084.
Oxides and hydroxides[2]	633,334	551,953	--	U.S.S.R. 237,398; Austria 130,211; Poland 128,690.
Ash and residue containing aluminum	698	504	--	All to West Germany.
Metal including alloys:[2]				
Scrap	8,709	8,740	--	Austria 4,086; Italy 2,952.
Unwrought	87,061	49,675	--	Poland 12,691; East Germany 7,347; Italy 6,775.
Semimanufactures	31,230	42,289	1,395	East Germany 7,510; Iran 5,379; Cuba 4,776.
Chromium:				
Ore and concentrate	2,552	1,720	--	All to Italy.
Oxides and hydroxides	72	93	--	Italy 87.
Copper:				
Sulfate	593	1,167	--	West Germany 867.
Ash and residue containing copper	71	70	--	All to West Germany.
Metal including alloys:				
Scrap	6,678	4,286	--	Austria 3,262; West Germany 845.
Unwrought	4,556	5,697	54	West Germany 4,866; Italy 437.
Semimanufactures	3,417	3,654	811	Austria 1,280; West Germany 1,262.
Iron and steel: Metal:				
Scrap	32,000	53,000	--	Italy 43,699.
Ferroalloys:				
Ferrochromium	20	23	--	All to Austria.
Ferrosilicomanganese	--	500	--	All to Norway.
Ferrosilicon	26	82	--	All to Austria.
Unspecified	401	73	--	Italy 46; West Germany 24.
Steel, primary forms[2]	9,990	6,522	--	West Germany 5,608.
Semimanufactures:				
Bars, rods, angles, shapes, sections[2]	713,322	569,527	--	Iran 162,092; West Germany 68,806; U.S.S.R. 60,450.
Universals, plates, sheets[2]	213,160	284,337	6,063	Iran 52,879; Italy 42,406; Yugoslavia 33,746.
Hoop and strip[2]	14,862	19,181	--	Greece 4,021; Romania 3,606; Iran 3,326.
Rails and accessories	111	480	--	Italy 465.
Wire[2]	15,907	14,089	--	Iran 9,813; Cyprus 868; Iraq 855.
Tubes, pipes, fittings[2]	86,818	73,866	51	Iran 28,587; East Germany 7,176.
Castings and forgings, rough[2]	19,178	16,179	--	Iran 5,174; West Germany 4,455.
Lead:				
Oxides	--	77	--	All to Austria.
Ash and residue containing lead	1,233	1,517	--	West Germany 1,379; Italy 138.
Metal including alloys:				
Scrap	2,391	6,566	--	Italy 3,821; West Germany 2,411.
Unwrought	498	881	--	All to Austria.
Semimanufactures	--	27	--	Indonesia 26.
Manganese: Ore and concentrate, metallurgical-grade[2]	221,066	15,865	--	Czechoslovakia 11,548; U.S.S.R. 4,000.

See footnotes at end of table.

Table 2.—Hungary: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982p	Destinations, 1982 United States	Destinations, 1982 Other (principal)
METALS —Continued				
Nickel: Metal including alloys:				
Scrap	172	361	32	Netherlands 275.
Unwrought	561	144	--	West Germany 94; Austria 50.
Semimanufactures	232	119	7	Yugoslavia 77; Sweden 25.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$395	$1,431	--	Switzerland $1,091; West Germany $269.
Silver:				
Waste and sweepings[3] do	$5,906	$4,840	--	West Germany $4,833.
Metal including alloys, unwrought and partly wrought do	$1,600	$341	--	Austria $184; West Germany $157.
Tin: Metal including alloys, scrap	--	33	--	All to United Kingdom.
Tungsten: Metal including alloys, all forms	1	1	--	All to Singapore.
Zinc:				
Matte	597	540	--	All to West Germany.
Metal including alloys:				
Scrap	1,012	947	--	West Germany 708.
Unwrought	22	120	--	All to Austria.
Other:				
Ores and concentrates	4	27	--	Italy 25.
Oxides and hydroxides	4	4,652	28	Austria 4,618.
Ashes and residues	11,975	12,939	--	Austria 12,590.
Base metals including alloys, all forms	37	20	--	West Germany 18.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	162	236	--	All to West Germany.
Artificial: Corundum	7,461	14,732	--	West Germany 6,619; U.S.S.R. 1,778.
Dust and powder of precious and semiprecious stones including diamond kilograms	--	3	--	All to Switzerland.
Grinding and polishings wheels and stones[2] value, thousands	$2,170	$2,038	$54	East Germany $763; Romania $652.
Asbestos, crude	2,529	4,859	--	All to Belgium-Luxembourg.
Boron materials: Oxides and acids	--	39	--	West Germany 20; Sweden 19.
Cement	185,448	143,713	--	Yugoslavia 118,316; U.S.S.R. 23,925.
Clays, crude:				
Bentonite	18,218	21,527	--	East Germany 10,324; Czechoslovakia 6,594.
Kaolin	6,615	5,995	--	Czechoslovakia 4,608; West Germany 1,271.
Diamond:				
Gem, not set or strung value, thousands	$52	$1,701	--	Belgium-Luxembourg $1,681.
Industrial do	$1,959	$1,173	--	Belgium-Luxembourg $1,142.
Diatomite and other infusorial earth	3,125	2,028	--	Austria 1,944.
Feldspar, fluorspar, related materials	2,705	1,781	--	All to Switzerland.
Fertilizer materials:				
Crude, n.e.s	20	73	--	Austria 60.
Manufactured:				
Ammonia[2] thousand tons	70	57	--	Yugoslavia 49.
Nitrogenous[2] do	1,306	1,384	--	Yugoslavia 152; undetermined 1,045.
Unspecified and mixed do	71	115	--	West Germany 51; Finland 30.
Pyrite, unroasted	--	20,213	--	West Germany 10,164.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked[2]	34,212	29,623	--	U.S.S.R. 21,255; East Germany 3,256.
Worked	388	161	--	Austria 84; West Germany 77.
Dolomite, chiefly refractory-grade	148	15,255	--	Poland 15,090.
Gravel and crushed rock	33,107	9,174	--	Austria 9,163.
Quartz and quartzite	17,468	20,976	--	All to Austria.
Sand:[2]				
Construction cubic meters	321,280	161,007	--	Czechoslovakia 157,386.
Industrial	60,309	31,364	--	Austria 16,748; Yugoslavia 14,616.
Sulfur:				
Elemental, crude including native and byproduct	3,046	10,796	--	Austria 10,078.
Sulfuric acid	63,284	70,858	--	Yugoslavia 64,384.
Other:				
Crude	106,017	100,214	(4)	East Germany 27,061; Austria 25,142.
Slag and dross, not metal-bearing	969	1,736	--	All to Austria.

See footnotes at end of table.

Table 2.—Hungary: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Destinations, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	319	2,776	--	Pakistan 2,399.
Coal:				
Anthracite and bituminous	[5]187,000	35,256	--	Yugoslavia 21,000; Austria 14,241.
Briquets of anthracite and bituminous coal	11,215	1,321	--	All to Austria.
Lignite including briquets[2]	42,422	35,085	--	Austria 19,153; U.S.S.R. 15,932.
Gas, natural: Gaseous million cubic feet	408	336	--	All to U.S.S.R.
Peat including briquets and litter	12,761	9,718	--	Austria 6,219; Yugoslavia 2,948.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	722	597	--	Yugoslavia 284; Netherlands 122.
Gasoline do.	1,094	289	--	West Germany 194; Austria 54.
Mineral jelly and wax do.	247	266	--	West Germany 74; Italy 65.
Kerosine and jet fuel do.	386	373	--	U.S.S.R. 229; East Germany 42.
Distillate fuel oil do.	1,482	810	--	U.S.S.R. 225; Poland 224.
Lubricants do.	289	522	--	Austria 285; Yugoslavia 70.
Residual fuel oil do.	1,947	1,715	--	Austria 1,145; Poland 348.
Bitumen and other residues do.	558	518	--	Austria 194; Algeria 138.

[p] Preliminary.

[1] Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Hungary, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data were compiled from United Nations information and data published by the partner trade countries.

[2] Official Trade Statistics of Hungary.

[3] May include other precious metals.

[4] Less than 1/2 unit.

[5] Statistical Yearbook of Members of Council for Mutual Economic Assistance, Moscow, U.S.S.R.

Table 3.—Hungary: Apparent imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	3	1,097	--	West Germany 1,069.
Oxides and hydroxides	265	222	--	West Germany 216.
Metal including alloys:				
Scrap	16	11	--	All from Austria.
Unwrought[2]	154,499	137,087	--	U.S.S.R. 134,359; Romania 2,501.
Semimanufactures[2]	5,759	6,262	1	East Germany 3,789; Romania 616.
Chromium:				
Ore and concentrate	711	14,440	--	U.S.S.R. 14,000.
Oxides and hydroxides	51	1	--	All from France.
Cobalt:				
Oxides and hydroxides	29	11	--	Do.
Metal including alloys, all forms	28	7	--	France 5; West Germany 2.
Copper:				
Sulfate[2]	3,661	3,480	--	All from U.S.S.R.
Metal including alloys:				
Scrap	2,816	4,417	--	Switzerland 1,837; West Germany 1,434.
Unwrought[2]	61,406	33,428	--	West Germany 2,967; undetermined 24,818.
Semimanufactures[2]	35,799	12,464	19	West Germany 1,875; Italy 361.
Iron and steel:				
Iron ore and concentrate:[2]				
Excluding roasted pyrite thousand tons	3,765	3,757	--	U.S.S.R. 3,589; Yugoslavia 66.
Pyrite, roasted do.	204	47	--	All from Yugoslavia.
Metal:				
Scrap[2]	144,000	14,000	--	NA.
Pig iron, cast iron, related materials[2]	289,546	234,024	--	U.S.S.R. 226,269; Yugoslavia 6,805.

See footnotes at end of table.

Table 3.—Hungary: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982^p	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Ferroalloys:				
Ferrochromium[2]	6,547	7,540	--	U.S.S.R. 5,901; West Germany 755.
Ferromanganese[2]	44,431	45,008	--	U.S.S.R. 25,941; Norway 13,699.
Ferromolybdenum	60	80	--	All from France.
Ferrosilicomanganese	--	70	--	All from West Germany.
Ferrosilicon[2]	6,863	7,783	--	U.S.S.R. 7,523.
Silicon metal	1,548	1,123	--	Norway 673; Italy 450.
Unspecified	15,725	11,074	--	U.S.S.R. 9,832.
Steel, primary forms[2]	433,562	368,772	--	U.S.S.R. 356,806; Bulgaria 9,754.
Semimanufactures:				
Bars, rods, angles, shapes, sections[2]	184,109	179,445	5	U.S.S.R. 146,397; Poland 14,105.
Universals, plates, sheets[2]	356,708	344,185	--	U.S.S.R. 241,118; Czechoslovakia 26,477.
Hoop and strip	9,970	7,684	3	West Germany 1,887; Italy 1,841.
Rails and accessories	3,000	569	--	West Germany 540.
Wire[2]	35,852	32,735	(3)	Czechoslovakia 14,985; West Germany 3,166.
Tubes, pipes, fittings[2]	89,827	103,055	3	East Germany 32,871; West Germany 23,017; Romania 17,879.
Castings and forgings, rough	15,959	14,318	--	Yugoslavia 10,297.
Unspecified[2]	1,087	1,384	--	France 1,297.
Lead:				
Oxides	1,817	2,061	--	Austria 1,245; France 637.
Metal including alloys:				
Unwrought[2]	11,033	13,647	--	West Germany 2,548; undetermined 10,398.
Semimanufactures	105	21	--	Italy 16.
Magnesium: Metal including alloys:				
Unwrought	569	173	--	Yugoslavia 100; Italy 73.
Semimanufactures	141	44	--	Austria 27; West Germany 10.
Manganese: Ore and concentrate, metallurgical-grade[2]	150	404	404	
Molybdenum: Metal including alloys, all forms	136	28	--	All from Japan.
Nickel: Metal including alloys:				
Unwrought	5	4	2	United Kingdom 2.
Semimanufactures	77	63	--	Italy 22; West Germany 17.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$6,097	$6,664	--	West Germany $3,911; Italy $2,376.
Silver: Metal including alloys, unwrought and partly wrought do.	$4,415	$2,562	--	United Kingdom $1,334; West Germany $1,175.
Tin: Metal including alloys:				
Unwrought[2]	1,369	1,772	--	NA.
Semimanufactures	20	13	(3)	Netherlands 10.
Titanium:				
Ore and concentrate	1,120	1,147	--	Italy 644; West Germany 503.
Oxides	2,619	1,254	--	United Kingdom 952; West Germany 302.
Tungsten: Metal including alloys, all forms	11	1	--	All from United Kingdom.
Zinc:				
Oxides	2,759	2,123	--	France 717; Austria 713.
Metal including alloys:				
Unwrought[2]	26,660	19,291	--	Poland 5,856; Yugoslavia 4,672.
Semimanufactures[2]	6,927	7,027	--	West Germany 467; undetermined 6,122.
Zirconium: Ore and concentrate	2,555	3,998	--	All from Italy.
Other:				
Ores and concentrates[2]	16,923	21,589	--	U.S.S.R. 21,288.
Oxides and hydroxides	2,238	3,620	--	Austria 3,527; West Germany 57.
Ashes and residues	72	4	--	All from Belgium-Luxembourg.
Base metals including alloys, all forms	54	117	--	Austria 73; West Germany 15.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	30	11	--	Italy 8; West Germany 3.
Artificial:				
Corundum[2]	2,346	1,394	85	Italy 876; West Germany 326.
Silicon carbide	--	874	--	All from Italy.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$163	$312	$195	United Kingdom $117.
Grinding and polishing wheels and stones[2] do.	$9,027	$7,041	$106	Austria $2,012; West Germany $1,618; U.S.S.R. $1,353.

See footnotes at end of table.

Table 3.—Hungary: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Asbestos, crude[2]	33,999	33,688	--	U.S.S.R. 30,218; Botswana 3,193.
Barite and witherite	17,299	21,212	--	Yugoslavia 19,148.
Boron materials:				
Crude natural borates	1,960	1,240	--	Netherlands 1,190.
Oxides and acids	3,695	2,982	--	U.S.S.R. 2,045; France 710.
Bromine[2]	713	579	--	East Germany 276; Israel 202.
Cement[2]	695,840	743,313	--	U.S.S.R. 454,724; Czechoslovakia 111,866.
Chalk	3,204	2,685	--	Austria 1,521; France 1,164.
Clays, crude:				
Chamotte earth[2]	72,371	73,568	1,096	Czechoslovakia 67,448.
Fire clay	22,279	18,451	--	Poland 17,074.
Kaolin[2]	30,868	37,772	580	Austria 13,984; Czechoslovakia 12,459.
Unspecified[2]	61,250	55,155	--	Czechoslovakia 46,798.
Diamond:				
Gem, not set or strung value, thousands	$337	$290	--	United Kingdom $106; Belgium-Luxembourg $95.
Industrial do.	$4,521	$2,987	$28	Belgium-Luxembourg $2,491.
Diatomite and other infusorial earth	2,218	543	--	France 517.
Feldspar, fluorspar, related materials	7,139	4,473	--	West Germany 1,367; Norway 1,120.
Fertilizer materials:				
Crude, n.e.s	250	1,000	--	All from France.
Manufactured[2]				
Nitrogenous, N_2 content	189,694	221,318	--	U.S.S.R. 203,506; United Kingdom 16,552.
Phosphatic, P_2O_5 content	136,041	160,017	64,729	Yugoslavia 43,756; U.S.S.R. 23,952.
Potassic, K_2O content	558,602	475,889	--	U.S.S.R. 349,814; East Germany 120,107.
Unspecified and mixed	102,273	126,001	24,964	Yugoslavia 84,172; Austria 16,729.
Graphite, natural	604	1,065	3	Austria 898; West Germany 145.
Gypsum and plaster[2]	22,000	89,583	--	East Germany 68,931; Romania 19,905.
Iodine[2]	54	888	--	Japan 610; U.S.S.R. 268.
Lime[2]	168,647	24,367	--	Yugoslavia 22,165.
Magnesium compounds:				
Magnesite[2]	91,396	101,161	--	Czechoslovakia 73,451; Austria 11,119.
Oxides and hydroxides	221	182	--	France 140.
Mica:				
Crude including splittings and waste	163	225	--	United Kingdom 218.
Worked including agglomerated splittings	48	19	--	West Germany 15.
Phosphates, crude[2]	674,150	567,966	--	U.S.S.R. 472,587; Morocco 43,572.
Pigments, mineral: Iron oxides and hydroxides, processed	3,095	3,150	--	West Germany 2,630.
Potassium salts, crude[2]	2,719	3,131	--	U.S.S.R. 2,082; East Germany 638.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$122	$109	--	Switzerland $76; West Germany $30.
Synthetic do.	$102	$115	--	Switzerland $109.
Pyrite, unroasted[2]	89,237	49,575	--	All from U.S.S.R.
Salt and brine[2]	768,006	755,482	--	Romania 472,566; U.S.S.R. 148,216.
Sodium compounds, n.e.s.:				
Carbonate, manufactured[2]	189,782	181,049	--	Bulgaria 110,996; Romania 59,009.
Sulfate, manufactured	1,875	1,675	--	All from Austria.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked[2]	5,214	34,476	--	Czechoslovakia 14,736; Bulgaria 6,024.
Worked	661	284	(3)	Italy 205; Austria 77.
Dolomite, chiefly refractory-grade	13	95	--	West Germany 81.
Gravel and crushed rock	9,422	11,035	--	Austria 6,843; Yugoslavia 1,889.
Quartz and quartzite	2,191	1,973	--	West Germany 1,838.
Sand other than metal-bearing	126,208	119,715	--	Czechoslovakia 97,192.
Sulfur:				
Elemental:				
Crude including native and byproduct[2]	183,164	163,701	--	Poland 138,197; U.S.S.R. 25,467.
Colloidal, precipitated, sublimed	35	7	--	All from West Germany.
Dioxide	--	466	--	West Germany 382.
Sulfuric acid[2]	11,837	4,357	--	Poland 4,297.
Talc, steatite, soapstone, pyrophyllite	3,366	2,953	--	Austria 1,301; Finland 1,294.
Other:				
Crude	59,709	135,065	--	Czechoslovakia 84,948; Bulgaria 13,848.
Slag and dross, not metal-bearing	164	322	--	Netherlands 268.

See footnotes at end of table.

Table 3.—Hungary: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	41	11	--	All from Austria.
Carbon: Carbon black and gas carbon[2]	20,067	22,416	--	U.S.S.R. 21,870.
Coal:[2]				
Anthracite and bituminous thousand tons	1,678	1,997	--	U.S.S.R. 1,014; Poland 579; Czechoslovakia 401.
Briquets of anthracite and bituminous coal do	524	489	--	All from East Germany.
Coke and semicoke[2] do	1,156	717	--	U.S.S.R. 309; Czechoslovakia 181; Poland 137.
Gas, natural: Gaseous[2] million cubic feet	141,329	138,911	--	U.S.S.R. 131,848; Romania 7,063.
Petroleum:				
Crude[2] thousand 42-gallon barrels	57,003	64,712	--	U.S.S.R. 51,303; Iran 7,979.
Refinery products:				
Liquefied petroleum gas do	255	256	--	U.S.S.R. 237; East Germany 18.
Gasoline[2] do	4,516	681	--	U.S.S.R. 399; Yugoslavia 191.
Mineral jelly and wax do	2	4	--	United Kingdom 2; West Germany 1.
Kerosine and jet fuel[2] do	2,100	1,876	--	U.S.S.R. 1,576; East Germany 82.
Distillate fuel oil[2] do	5,348	5,994	--	U.S.S.R. 5,885; United Kingdom 92.
Lubricants[2] do	123	103	(3)	U.S.S.R. 73; Netherlands 9.
Residual fuel oil[2] do	225	543	--	U.S.S.R. 430; United Kingdom 113.
Petroleum coke do	78	4	4	

[p] Preliminary. NA Not available.

[1] Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Hungary, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data were compiled from United Nations information and data published by the partner trade countries.

[2] Official Trade Statistics of Hungary.

[3] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—Although the expected 3.6-million-ton bauxite output was not achieved in 1983, Hungary mined nearly 3 million tons, which was up by about 300,000 tons over that of 1982. This was due to improved export demand and the startup and expansion of a number of mines under development in 1982. The operational startup at Bito-2 underground mine, an extension of the long-established Kincsesbanya operation in the Fejer area, began early in the year. At full rated operating capacity, this new operation would produce an additional 400,000 tons of bauxite per year in the Fejer mining district. The expansion of open pit workings in the Bakony area was to have been completed in 1983 with an additional 200,000-ton-per-year capacity. Also, the development and construction of the Fenyoefoe Mine, begun in 1982, continued in 1983 and would reportedly commence operations in 1984.

The major activity during 1983 in the aluminum industry was the continued work to expand production at the Szekesfehervar Light Metal Works. With the installation of a new rolling mill, the added production capacity of finished and semimanufactured aluminum goods would be doubled. The startup of the new mill was planned for 1984.

In 1983, the on-going Hungary-U.S.S.R. alumina-aluminum agreement was extended through 1990. In accordance with this agreement, Hungary would ship 530,000 tons per year of alumina and 5,000 tons per year of aluminum semimanufactures to the U.S.S.R. In turn, the U.S.S.R. would process the alumina into aluminum and ship back 205,000 tons each year to Hungary owing to Hungary's shortage of electric power capacity. The earlier phase of the agreement had called for annual shipments of 330,000 tons of alumina to the U.S.S.R. in return for 165,000 tons of aluminum to be sent back to Hungary. To implement the new agreement, Hungary would have to increase its alumina as well as aluminum production. While such new capacities were under development, a commercial agreement signed with Greece during the year provided for long-term imports of about 400,000 tons per year of alumina by Hungary to compensate for a temporary lack in domestic capacity.

To help market Hungarian aluminum products to Western Europe, the formation of a joint marketing company between Hungary and the Federal Republic of Germany was announced. The new company, AluTrade Aluminium-handelsgesellschaft, was reportedly to begin operations in July 1983.

Copper.—Copper mining in Hungary ended in 1980 with the depletion of the old Recsk gold-copper mine. The development of a deep-lying copper deposit in the Recsk area had been discontinued after unfavorable feasibility studies were conducted in 1981 and 1982. The deposit, currently a reserved resource, could only be developed under more favorable copper prices and with the availability of capital.

Gallium.—The production of gallium at the Ajka alumina plant reportedly reached 3,000 kilograms, a significant increase over previous years, owing to improved technology at the Ajka facility. Gallium is an important element in the production of semiconductors, and most of Hungary's production was reportedly exported, with a substantial amount sold to Japan. During 1983, work continued on a new gallium pilot plant at Ajka, based on Soviet know-how, that would serve as the technical basis for a new facility at Ajka.

Iron and Steel.—Most of Hungary's requirements for iron ore were met by imports from the U.S.S.R., although some siderite ore was produced at the Rudabanya Mine.

Developments at Hungary's Danube Iron and Steel Complex at Dunaujvaros included the startup of the second Soviet-made oxygen converter, which raised the plant's total capacity to 1.15 million tons per year. The Danube Complex also announced construction plans for a new coking plant that would become operational in 1987. In June 1983, an accident occurred at the Danube Complex converter shop, causing extensive damage, which resulted in a production loss of about 41,000 tons of steel. At the Lenin Steelworks at Diosgyor, new capacities completed during the year included a continuous caster and an 80-ton electric furnace, which raised the plant's raw steel capacity to 1.1 million tons per year. Also, production of new types of stainless steel was begun for use in the chemical and nuclear industries.

In accordance with Government policy to streamline ailing and noncompetitive industries, the Csepel Iron and Metalworks was decentralized in July. This large-scale machine manufacturer was decentralized into a total of 15 independent enterprises to improve production and marketing efficiency. Planned production for the iron and steel industry in 1984 included the output of 2.2 million tons of pig iron, 3.8 million tons of crude steel, and 2.9 million tons of rolled stock.

Lead and Zinc.—Most of Hungary's requirements for lead and zinc had to be met through imports. Although some operations at the Gyongyosoroszi Mine continued, this long operating lead-zinc deposit was reportedly at the point of depletion.

Manganese.—The mining of manganese deposits in the Urkut area in northwest Hungary continued to meet domestic and export needs. Owing to a shortage of low-cost electric power, Hungary does not produce ferromanganese; domestic consumption appears to be limited to direct charges of some concentrate to oxygen converters at the Danube Iron and Steel Complex. During the year, negotiations were reportedly conducted with the Federal Republic of Germany for development of the Urkut mining area.

NONMETALS

Cement.—Production of cement continued to decline because of curtailed investment in capital construction projects.

Dolomite.—Most of Hungary's sizable dolomite deposits were mined at Hejocsaba and Miskolc in the northern mountain area and at Pilisvososvar in Transdanubra; the total production capacity was about 850,000 tons per year. Most of the production was domestically consumed, and about 40,000 tons of the material was exported.

Perlite.—As a major world producer of perlite, Hungary's proven reserves are about 10 million tons. Long-term development of the industry was planned, which would allow the production of expanded perlite to reach 2.5 million cubic meters by 1990.

Zeolite.—A new 6,000-ton-per-year opencast mine was reportedly put into operation near Bodrogkeresztur, east of Miskolc. Approximately 4 million tons of recoverable material was reported in this region.

MINERAL FUELS

To reduce dependence on imported energy, Hungary continued to reduce consumption of most fuels. By yearend 1983, the decrease in petroleum consumption had amounted to about 1 million tons compared with that 5 years earlier. During the same period, however, the consumption of electric power increased by about 1.1% above the planned level.

Coal.—Exploration at Dubicsany in Sajo Valley in 1983 uncovered about 100 million tons of low-ash and low-sulfur coal, of which 60 million tons could be readily mined.

In June, two major accidents occurred at the Markushyegy Mine at Oroszlany and at the Kanyas Mine of the Nograd Colliery, which resulted in 37 fatalities. The accident could reportedly lead to a reappraisal of mine safety procedures.

Petroleum and Natural Gas.—The production plan for petroleum and natural gas was met. Hungary's National Oil and Gas Industry Trust offered bonds for subscriptions to finance a new gas pipeline. This was the first time a centrally planned economy country had issued bonds for financing industrial projects, and it was viewed as a possible forerunner for future bond issues. Petroleum accounted for approximately 35% of Hungary's energy requirements, followed by coal at 30% and gas at 27%. About 40% of the country's natural gas and 75% of its petroleum was imported from the U.S.S.R. Imports from other areas were small, except for some refined products.

Nuclear Power.—The Paks nuclear power station officially started up its first, Soviet-supplied, 440-megawatt reactor, and work continued on three additional units. Late in the year, it was reported that the Czechoslovak Skoda works supplied a 12-meter-long, 215-ton reactor tank for the third unit.

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[1] Foreign mineral specialist, Division of Foreign Data.

The Mineral Industry of Iceland

By Joseph B. Huvos[1]

Without significant mineral resources, Iceland has an abundance of hydroelectric and geothermal power, supporting energy-intensive industries for the processing of imported raw materials. The mineral industry's chief contribution to the national economy continued to be aluminum, ferroalloys, and some nonmetallic minerals.

Iceland's gross national product declined by about 6% to a level of about $2.2 billion.[2] By yearend, an economic austerity program introduced in May had lowered the inflation rate from three-digit levels to about 30%. As a first measure, indexation of wages was suspended for 2 years, and the intention was to lower the inflation rate to 10% in 1984 by various additional measures. Iceland's minerals industry expanded during 1983 as more aluminum and ferrosilicon were produced. Unemployment was still only 0.5%. Important events included the reaching of an agreement on the price of electricity for the aluminum industry, and on an accompanying tax dispute, and a decision to speed up construction of a steel mill in Reykjavik.

PRODUCTION

Production of aluminum and ferrosilicon, Iceland's chief industrial products, both regained near-capacity level. Production of cement, pumice, and salt increased.

Table 1.—Iceland: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983[p]
Aluminum metal, primary	72,145	73,111	74,577	61,500	77,011
Cement, hydraulic thousand tons	127	122	122	28	120
Diatomite	21,288	18,150	19,840	24,965	25,501
Iron and steel: Metal:					
Scrap	3,708	3,690	NA	3,922	10,882
Ferroalloys, ferrosilicon	15,000	25,309	33,612	42,200	51,008
Nitrogen: N content of ammonia[e]	7,000	7,000	7,000	8,000	8,000
Pumice	24,462	36,000	33,945	8,700	45,000
Salt	--	53	50	100	500
Sand and gravel:					
Calcareous thousand cubic meters	180	109	114	120	125
Basaltic cubic meters	6,200	4,900	5,000	5,300	5,500
Stone:					
Crushed and broken do	25	24	21	21	20
Scoria do	110	[e]95	98	104	97
Silica dust	4,400	4,400	4,900	4,200	[e]4,200

[e]Estimated. [p]Preliminary. NA Not available.

[1] Table includes data available through May 2, 1984.

TRADE

There was no significant change in Iceland's pattern of minerals traded, aluminum and ferrosilicon being the main mineral export items. Principal mineral imports were petroleum products, coal, and alumina. The United States was one of the major importers of Icelandic ferrosilicon.

Table 2.—Iceland: Exports of mineral commodities

(Metric tons)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, unwrought	63,187	61,531	--	Switzerland 19,559; Italy 8,994; United Kingdom 8,013.
Iron and steel: Metal:				
Scrap	3,125	3,482	--	Norway 3,403.
Ferrosilicon	32,082	42,174	4,413	West Germany 14,776; Japan 13,833; United Kingdom 5,581.
Other: Base metals including alloys, scrap	566	440	--	Denmark 238; Netherlands 180.
NONMETALS				
Abrasives, n.e.s.: Natural: Corundum, emery, pumice, etc	33,945	18,733	--	Norway 13,413; Denmark 3,521; Sweden 1,193.
Diatomite and other infusorial earth	19,836	24,966	--	West Germany 6,793; Denmark 4,023; Italy 1,804.
Salt and brine	5	--		

Table 3.—Iceland: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Unspecified value	$1,790	$474	--	NA.
Aluminum:				
Oxides and hydroxides	134,166	117,331	--	Guinea 58,804; Australia 58,520.
Metal including alloys:				
Unwrought	15	46	--	Netherlands 27; United Kingdom 18.
Semimanufactures	1,173	1,180	10	Norway 378; West Germany 243; Switzerland 135.
Chromium: Oxides and hydroxides	3	2	--	All from West Germany.
Cobalt: Oxides and hydroxides value	$138	$162	--	NA.
Copper: Metal including alloys:				
Unwrought	2	4	--	All from Denmark.
Semimanufactures	192	203	24	West Germany 66; Portugal 23.
Gold: Metal including alloys, unwrought and partly wrought value	$137,290	$138,381	NA	Switzerland $47,037; United Kingdom $41,208; Netherlands $13,439.
Iron and steel:				
Iron ore and concentrate, excluding roasted pyrite	15,571	11,936	--	All from Norway.
Metal:				
Pig iron, cast iron, related materials	588	669	27	France 321; West Germany 109; Norway 100.
Ferroalloys	10	10	--	All from Netherlands.
Steel, primary forms	1,022	1,061	--	Sweden 526; Norway 270; Belgium-Luxembourg 191.

See footnotes at end of table.

Table 3.—Iceland: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Semimanufactures:				
Bars, rods, angles, shapes, sections	18,262	20,986	2	Norway 7,317; Sweden 2,632; West Germany 2,175.
Universals, plates, sheets	14,373	12,693	(1)	Belgium-Luxembourg 3,501; Sweden 2,735; West Germany 1,776.
Hoop and strip	501	482	12	West Germany 155; Belgium-Luxembourg 112; Denmark 88.
Rails and accessories	24	8	--	West Germany 3; Norway 3.
Wire	370	181	(1)	Belgium-Luxembourg 69; United Kingdom 53.
Tubes, pipes, fittings	9,931	7,005	8	West Germany 2,852; Netherlands 1,335; Denmark 705.
Castings and forgings, rough	161	161	(1)	Denmark 85; West Germany 60.
Lead:				
Oxides	31	18	--	West Germany 11; United Kingdom 5.
Metal including alloys:				
Unwrought	271	304	(1)	Denmark 303.
Semimanufactures	14	17	(1)	West Germany 12; Denmark 4.
Magnesium: Metal including alloys, semimanufactures value	--	$405	--	All from West Germany.
Mercury 76-pound flasks	6	3	--	West Germany 2; Norway 1.
Nickel: Metal including alloys, semimanufactures	1	1	(1)	NA.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value	$206,142	$169,122	$6,000	Switzerland $155,190.
Silver: Metal including alloys, unwrought and partly wrought do	$137,428	$153,255	$3,000	West Germany $92,293; United Kingdom $14,734; Denmark $14,653.
Tin: Metal including alloys:				
Unwrought	1	1	--	All from Denmark.
Semimanufactures	9	8	(1)	Denmark 6; United Kingdom 1.
Titanium: Oxides	1,121	434	--	United Kingdom 232; West Germany 100; France 80.
Tungsten: Metal including alloys, all forms value	$551	$2,105	--	All from Norway.
Uranium and/or thorium: Metal including alloys, all forms do	--	$729	$729	
Zinc:				
Oxides	17	13	--	West Germany 8; Norway 3.
Blue powder	--	5	--	Norway 4.
Metal including alloys:				
Unwrought	84	89	--	Norway 69; Belgium-Luxembourg 20.
Semimanufactures	32	3	--	West Germany 1; United Kingdom 1.
Other:				
Ores and concentrates	--	30	--	Norway 20; West Germany 5.
Oxides and hydroxides	5	8	--	West Germany 5; Norway 2.
Base metals including alloys, all forms	(1)	11	--	United Kingdom 6; Canada 3.
NONMETALS				
Abrasive, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1	27	16	Italy 6; West Germany 4.
Grinding and polishing wheels and stones	33	23	2	West Germany 9; Switzerland 3; France 2.
Asbestos, crude	7	4	--	China 2; Denmark 1.
Barite and witherite	56	68	--	West Germany 54; Denmark 14.

See footnotes at end of table.

Table 3.—Iceland: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Boron materials:				
Crude natural borates	20	10	10	
Oxides and acids kilograms	300	900	--	All from West Germany.
Cement	5,177	2,958	5	Denmark 2,595; Belgium-Luxembourg 319.
Chalk	352	363	--	Norway 124; France 108; United Kingdom 85.
Clays, crude: Unspecified	434	332	41	United Kingdom 164; Netherlands 82.
Cryolite and chiolite	1,900	50	--	All from Denmark.
Diamond:				
Gem, not set or strung value	$27,541	$40,641	--	Belgium-Luxembourg $31,493.
Industrial do	$7,436	$2,429	--	Belgium-Luxembourg $1,700; United Kingdom $729.
Diatomite and other infusorial earth	30	2	(1)	United Kingdom 1.
Fertilizer materials: Manufactured:				
Ammonia	4,846	2,930	--	Norway 2,920.
Nitrogenous	4,286	1,832	--	Norway 1,789; Denmark 23.
Phosphatic	1,500	1,692	--	All from Netherlands.
Potassic	8,384	9,029	--	East Germany 9,028.
Unspecified and mixed	37,542	30,333	1	Norway 18,499; Netherlands 11,483.
Graphite, natural	(1)	3	--	All from Denmark.
Gypsum and plaster	8,311	3,747	--	Sweden 2,485; East Germany 1,231.
Lime	581	781	--	United Kingdom 525; West Germany 233.
Magnesium compounds: Unspecified	1	--		
Mica:				
Crude including splittings and waste	7	10	--	All from Norway.
Worked including agglomerated splittings	1	(1)	--	All from West Germany.
Nitrates, crude	--	6	--	Do.
Pigments, mineral: Iron oxides and hydroxides, processed	42	17	--	Denmark 10; West Germany 5.
Precious and semiprecious stones other than diamond:				
Natural value	$1,928	$891	--	NA.
Synthetic do	$20,015	$7,934	--	Belgium-Luxembourg $5,667.
Pyrite, unroasted	--	5	--	All from Netherlands.
Salt and brine	77,810	69,699	2	Spain 53,145; West Germany 3,012.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	1,224	1,463	10	East Germany 1,000; West Germany 303.
Sulfate, manufactured	74	82	--	West Germany 55; Denmark 23.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	117	116	--	Italy 43; Sweden 21; India 16.
Worked	226	279	(1)	Italy 182; West Germany 58.
Dolomite, chiefly refractory-grade	94	179	--	Norway 173.
Gravel and crushed rock	299	339	--	Sweden 304; Italy 24.
Limestone other than dimension	71	108	--	All from Denmark.
Quartz and quartzite	74,851	80,802	26	Norway 80,699.
Sand other than metal-bearing	367	4,618	47	Norway 4,386; United Kingdom 79.
Sulfur:				
Elemental:				
Crude including native and byproduct	--	72	22	Denmark 50.
Colloidal, precipitated, sublimed	3	1	--	NA.
Dioxide	4	28	--	United Kingdom 16; Denmark 12.
Sulfuric acid	72	353	--	Norway 300; Denmark 32.
Talc, steatite, soapstone, pyrophyllite	104	111	--	Norway 106; Denmark 4.
Other: Crude	13	43	--	Sweden 40.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	969	3	--	Netherlands 2.
Carbon: Carbon black	10	6	--	Norway 5.
Coal:				
Anthracite	20,238	24,516	--	Belgium-Luxembourg 15,617; Poland 8,821.
Bituminous	3,757	111	--	West Germany 105.
Coke and semicoke	26,281	23,817	593	Norway 12,019; United Kingdom 11,103.
Peat including briquets and litter	1,033	62	--	Finland 43; Denmark 18.

See footnotes at end of table.

Table 3.—Iceland: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	11,264	10,208	--	Netherlands 10,104.
Gasoline:				
Aviation do	852,433	880,824	--	U.S.S.R. 640,133; Portugal 217,925.
Motor do	17,638	15,486	--	Netherlands 14,767; Finland 340.
Mineral jelly and wax do	1,550	2,495	55	United Kingdom 1,330; West Germany 771.
Kerosine and jet fuel do	362,382	439,619	23	Netherlands 335,482; United Kingdom 59,915.
Distillate fuel oil do	1,664,000	1,520,423	--	U.S.S.R. 872,537; Netherlands 384,018; Portugal 263,868.
Lubricants do	46,179	75,173	2,065	Portugal 24,290; United Kingdom 22,722; Norway 9,170.
Residual fuel oil do	1,164,000	942,004	--	U.S.S.R. 932,553.
Bitumen and other residues do	79,725	70,514	--	United Kingdom 59,691; Norway 9,538.
Bituminous mixtures do	2,066	2,230	109	Sweden 1,042; Denmark 364.

NA Not available.

[1] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—Aluminum production at Icelandic Aluminum Co. Ltd.'s (ISAL) 85,000-ton-per-year Straumsvik reduction plant increased to about 77,000 tons. As world aluminum prices rose, the 34,000 tons of stocks accumulated at the plant in 1982 were drawn down. Ending a several-year-long dispute, a provisional agreement, valid for 1 year and including an increase of about 50% in the price of electricity to ISAL's reduction plant, was finally reached between the Icelandic Government and Swiss Aluminium Ltd. (Alusuisse), owner of the plant. As a result of the first part of the settlement, the dispute was to be withdrawn from international arbitration, where it was deadlocked. Instead, an independent committee of inquiry would be set up to decide how the amount of tax owed by the company was to be calculated. Also to be discussed were (1) further increases in the price of electric power, (2) plans for possible expansion of the plant, (3) the right of the Government to become a shareholder in ISAL, and (4) Alusuisse's right to sell 50% of the plant to a third party, if approved by the Icelandic Government.

Ferrosilicon.—While ferrosilicon production by Icelandic Alloys Ltd. increased to 48,500 tons, which was the nominal capacity of the plant, depressed world ferrosilicon prices continued to weaken profitability. In 1982, the United States remained one of the major importers of Icelandic ferrosilicon.

Iron and Steel.—Iceland's steelworks project moved forward with the signature of a contract to buy a steel rolling mill in Sweden. Concurrently, Icelandic Steel Co. (Stalfelagid), owned by about 900 private individuals and companies, was calling for tenders to supply a melting shop and caster. The timetable called for rolling operations to begin billet production in 1985. The contract signed was with the Swedish steel company Halmstads Järnverks AB, which was to supply to Stalfelagid the bar-section mill currently operated by its subsidiary Quarnshammars Jernbruck of Sweden. Initial capacity of the 14-stand mill, when re-erected near Reykjavik, will be 20,000 to 25,000 tons per year of reinforcing bars; later, the mill will be modified to produce merchant bars as well. Billets will be supplied by Halmstads to Stalfelagid during the initial period until the melting shop is completed. Legally, 40% of Stalfelagid can be foreign owned, and Halmstads is expected to take a share.

Raw material for the 7,500-ton-per-year electric furnace will be scrap from old ships, which is available locally, and of which 8,000 to 10,000 tons per year have been exported. Stalfelagid plans to build a harbor and dry dock and also import ships for breaking. The Icelandic reinforcing bar market, excluding the large military base, has amounted to about 12,000 to 13,000 tons per year, with demand as high as 15,000 to 16,000 tons per year.

NONMETALS

Diatomite.—Diatomite production increased slightly in 1983. Manville Corp. of the United States owned 39% of the operation and the Icelandic Government held 51%.

Pumice.—Jardefnaidnadur, an Icelandic company, delivered 6,500 cubic meters of pumice from the Mount Hekla area to the Federal Republic of Germany, for use there in the building industry. Jardefnaidnadur engaged a contractor to process and load the material. This trial order may be followed by orders of 75,000 cubic meters per year.

MINERAL FUELS

In 1983, hydroelectric and geothermal energy supplied about 65% of Iceland's energy needs of about 2.2 million tons of standard coal equivalent; of the remaining, 33% was imported petroleum, and about 2%, coal.

Coal.—Icelandic coal imports of about 157 tons in 1978, increased to about 24,000 tons by 1982, because of consumption for the production of ferrosilicon. In 1983, the Akranes cement plant was converted from oil to coal, making imports of a further 20,000 tons of coal per year necessary. Conversion to coal will reduce by one-half the fuel bill of the plant. Current standards require that the sulfur content of the coal should not exceed 1.5% and that the coal should be handled in covered trucks and stored in enclosed areas.

Geothermal Energy.—As reported, investment in geothermal heating registered a drop of 43% as many local heating projects were completed. The 60-megawatt, steam-powered Krafla powerplant in northeast Iceland was apparently built without sufficient assurance of energy supplies and has been running far below its potential of 10 to 20 megawatts for the past few years. Volcanic activity and earthquakes were disrupting boreholes and delaying plans for further drilling operations. The powerplant was in debt by about $78 million, but recent studies have shown that certain additional investments would make it possible to operate the plant at full capacity and at a profit by 1986.

Hydroelectric Power.—Reportedly, investment in hydroelectric power generation and distribution declined by 15%. Major energy infrastructure development projects seemed likely to be delayed for lack of investment; however, the Government was actively seeking foreign equity investment for the energy and energy-intensive industries. For a long time, Iceland had the cheapest energy supply in the world; however, recently, energy bills have risen. Domestic rates were 124 mills in Reykjavik, as against an average of 75 mills in 32 cities in the United States. Prices range from 20 mills in Seattle to 130 mills in New York. In Iceland, 80% of all houses were heated by geothermal energy, 13% by electricity, and 7% by oil. Electricity generated was valued at $24 million, of which one-half was consumed by industry. If the total were to be generated by imported oil, it would have cost about $200 million in foreign exchange.

Petroleum.—The Norwegian Oil Directorate decided to conduct the first seismic studies on the Continental Shelf around Jan Mayen Island, at a cost of $13 million. Studies will cover 3,000 kilometers of seismic lines in both Norwegian and Icelandic territory. According to an agreement between the two countries, Iceland has the right to a 25% share of any productive finds in this part of the shelf, without having to pay expenses of exploration.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from new Icelandic krona (IKr) to U.S. dollars at the rate of IKr24.09=US$1.00.

The Mineral Industry of India

By Gordon L. Kinney[1]

The Indian economy staged a significant comeback after a generally poor year in 1982. The value of mineral production in 1983 was estimated to be $6.4 billion,[2] a 28% improvement over that of 1982. The major part of the increase was accounted for by mineral fuels. Other minerals that showed favorable development during the year included copper, lead, zinc, limestone, and phosphorite. Iron, manganese, and tungsten ores, and several of the nonmetallic minerals were not as strong as in 1982.

The value of mineral production increased by at least 10% over that of 1982 in Assam, Gujarat, Karnataka, Madhya Pradesh, Maharashtrà, Rajasthan, Uttar Pradesh, and in the Bombay High offshore area. Only Goa and Kerala of the principal mineral producing States had a lower value of production for the year.

The Geological Survey of India (GSI) was given permission to carry out its plan to complete the geological mapping of the country by 1990. GSI was to acquire sophisticated aircraft for airborne mineral surveys and exploration. In 1984, it was scheduled to get two more coastal research vessels for offshore marine geology and mineral exploration. GSI in 1983 launched a 10-year program for the systematic mapping and exploration of the territorial waters and the exclusive economic zone in the new research vessel *Samudramanthan*. GSI planned to carry out geological, geophysical, and geochemical studies to locate possible placer and other mineral resources. It planned to cover 180,000 square kilometers during 1984. The program was to be coordinated with remote sensing from aircraft to study the movement of suspended matter in areas where sediment plumes are known to occur.[3]

GSI's continuing mineral surveys made some potentially economic discoveries in the 1982 and 1983 field seasons. Tungsten, lead, zinc, talc, and magnesite deposits were reported in Almora district of Uttar Pradesh. Vanadium-bearing titaniferous magnetite and manganese deposits were reported from Uttara Kannada district of Karnataka. High-grade veins of chalcopyrite were located in Chitradurga district and molybdenite in Kolar district of Karnataka. Reportedly, large deposits of nickel, cobalt, zinc, and lead, with traces of silver and vanadium, were discovered in Subusiri district of Arunachal Pradesh in the northeast corner of India.[4] In the Phalet area of Udaipur district, Rajasthan, six boreholes indicated copper values of 0.94% to 3.1% Cu over a strike length of 500 meters and vein widths of 3 to 7 meters. Delineation drilling for gold in the Chigargunta Block, Chittoor district, Andhra Pradesh, has extended the old E2 lode over a strike length of 1.05 kilometers at an average grade of 5 grams per ton.[5]

Although electricity generation has grown rapidly, lack of reliable power continued to be one of the principal constraints on industrial growth. The mineral industry was particularly affected because of the severe problems created by nonscheduled power interruptions to many processing and refining operations. Unannounced power outages, which hit mineral industry facilities frequently, cause damage far more costly than lost production time.

In 1981, electricity generation grew by 10.1%, in 1982 by 7.9%, and in 1983 by 6.2%. Nevertheless, it was estimated that demand exceeded supply by 11% in 1983. This gap between demand and supply was expected to be a salient feature in the Indian economy for the foreseeable future. Major factors accounting for the shortfall were low generating capacity utilization (less than 50% in thermal units), delays in commissioning new plants, and transmission losses well over 20%. These technical problems, in turn, were closely related to such very sensitive issues of public policy as the allocation of power between the agricultural and industrial sectors and consistent underpricing of electricity tariff structures. Despite the problems, generating capacity increased by 4,093 megawatts in fiscal year (FY) 1983. Total installed capacity in the public sector was 39,456 megawatts, of which thermal units accounted for 62%, hydro for 35%, and nuclear for 3%. The seventh 5-year plan, which will begin in April 1985, calls for additional capacity of 27,800 megawatts.

Preliminary calculations estimated the increase in real gross national product (GNP) for FY 1983[6] to be 7%. Growth in industrial production was over 5% during FY 1983, somewhat better than the 3.9% (revised) of FY 1982. Contributing to the industrial growth was the steady increase in oil production, now equal to about two-thirds of consumption. The increased domestic petroleum output reduced requirements for imported oil, and hence some of the heavy drain on India's foreign exchange.

Major obstacles to better performance were low agricultural income, continued severe power shortages, and an elaborate system of Government controls on industrial production. Better capacity utilization and greater efficiency in both the public and private sectors appear to be the main avenues for boosting growth.

Following 2 years of relative price stability, FY 1983 was marked by a resurgence in inflationary pressures. Average wholesale prices increased by 9.3% compared with a modest 2.5% in FY 1982. The average consumer price index increased even more rapidly—by 12.6%, compared with 7.8% in FY 1982.

The Government's persistent budget deficit, equivalent to 7.6% of GNP in FY 1983, was at least in part the result of poor financial performance of the public sector corporations, most of which were plagued by low productivity and cost overruns. Preliminary FY 1983 figures show public sector corporations lost $29 million versus a profit of $680 million in FY 1982. The losses would have been much larger had it not been for the $1.1 billion profits of the oil industry.

The Government announced an increase in the minimum wages paid to mine workers of 11.6% as of October 19, 1983. The new wages for aboveground workers range from $0.97 to $1.50 per day. Underground workers' wages range from $1.17 to $1.80 per day.

PRODUCTION

The State of Bihar, long the leader for value of mineral production, took second place to the Bombay High offshore oil and gas fields. The value of Bombay High production accounted for 27% of total mineral production value in India, followed by Bihar, 19.8%; Assam, 12.6%; Madhya Pradesh, 10%; Gujarat, 8%; and West Bengal, 6.6%. Much of the natural gas from Bombay High was flared. As more of the gas is sold for fertilizer production in coming years, the value will continue to increase. The value of mineral fuels accounted for nearly 90% of total mineral value. Petroleum edged out coal, the traditional mineral value leader, for the first time. Nonmetallics and metallics were about even in value with about 5% each. Of the nonfuel mineral ores, iron was first in value, followed by limestone, copper, manganese, gold, mica, zinc, and chromite.

The performance of the cement industry was of particular interest in showing effects of Government controls. Prior to March 1982, cement prices were fixed. Production was poor, output rationed, and a black market flourished. In March 1982, cement prices were partially decontrolled. Producers had to sell two-thirds of their output to the Government at a fixed price, and the remainder could be sold on the open market. Production immediately increased by 10% to 23.3 million tons in FY 1982, and by 14.6% to 26.7 million tons in FY 1983. Production for FY 1984 was expected to exceed 32 million tons. At the same time, prices have fallen substantially, and the black market has virtually disappeared.[7]

Other mineral production has been mixed. The public sector fertilizer plants operated at less than 50% of capacity, bringing Parliamentary criticism. Only the addition of new capacity and the privately owned plants allowed overall production to increase marginally. Several of the more important minerals showed encouraging increases. These included aluminum, bauxite, coal, chromite, copper ore, lead ore, limestone, and zinc ore. Iron ore, manganese ore, and mica were the most important minerals showing a decline.

Table 1.—India: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982	1983[p]
METALS					
Aluminum:					
Bauxite, gross weight thousand tons	1,952	1,785	1,923	1,854	1,923
Alumina, gross weight do.	493	[e]500	[e]500	[e]500	[e]450
Metal, primary	211,428	184,838	212,844	216,679	[3]220,000
Cadmium metal	166	89	113	131	133
Chromium: Chromite, gross weight	309,841	319,538	334,681	339,196	422,000
Copper:					
Mine output, metal content	27,700	27,600	25,200	24,000	24,500
Metal:					
Smelter	21,455	28,489	25,743	32,585	[3]35,469
Refined (electrolytic wirebar)	14,707	17,021	14,887	15,066	19,585
Gold metal, smelter troy ounces	84,781	78,834	79,875	71,935	70,158
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	39,859	41,936	41,354	40,902	38,800
Iron content do.	24,952	26,252	25,888	25,605	24,289
Metal:					
Pig iron do.	8,748	8,493	9,474	9,600	9,126
Ferroalloys:					
Ferrochrome	22,249	16,012	31,066	40,244	31,119
Ferromanganese	186,803	162,650	208,836	150,707	125,594
Ferrosilicon	53,087	42,606	60,253	36,060	41,187
Ferrosilicochrome	3,851	4,037	4,408	[e]4,000	11
Other	2,844	535	9,074	[e]14,000	[e]11,000
Steel, crude:					
Steel ingots thousand tons	9,936	9,358	10,300	10,628	10,216
Steel castings do.	65	[e]65	[e]80	87	89
Total do.	10,001	[e]9,423	[e]10,380	10,715	10,305
Semimanufactures:[3]					
Angles, shapes, sections do.	[e]1,000	[e]1,000	NA	NA	NA
Bars and rods do.	[e]2,200	[e]2,200	NA	NA	NA
Plates and sheets:					
Uncoated do.	[e]1,100	[e]1,000	NA	NA	NA
Galvanized do.	[e]200	[e]200	NA	NA	NA
Tinplate do.	[e]100	[e]100	NA	NA	NA
Hoop, strip, strapping, skelp do.	[e]1,100	[e]1,100	NA	NA	NA
Rails and accessories do.	400	[e]350	NA	NA	NA
Wire do.	234	[e]240	NA	NA	NA
Special steels, not further specified do.	518	[e]550	NA	NA	NA
Total do.	6,852	[e]6,740	6,600	[4]6,565	[4]6,511
Lead:					
Mine output, metal content	15,960	12,720	15,320	16,640	25,700
Metal, refined:					
Primary	9,820	14,846	14,325	14,413	14,960
Secondary	10,800	10,732	11,081	8,780	6,596
Total	20,620	25,578	25,406	23,193	21,556
Magnesium	28	13	15	7	--
Manganese ore and concentrate, gross weight thousand tons	1,771	[r]1,692	1,526	1,448	1,320
Rare-earth metals: Monazite concentrate, gross weight[e]	3,254	3,395	3,704	4,000	4,000
Selenium kilograms	4,596	4,148	4,104	5,351	3,684
Silver, mine and smelter output thousand troy ounces	370	366	555	463	469
Titanium concentrates, gross weight:					
Ilmenite	[3]146,843	[3]167,900	[r]162,514	152,900	[e]150,000
Rutile	[3]4,940	[3]5,360	[r]6,710	6,700	[e]7,000
Tungsten, mine output, metal content	18	22	18	25	15
Zinc:					
Mine output, concentrate:					
Gross weight	71,774	46,489	52,876	52,839	77,594
Metal content	39,476	26,457	29,082	29,060	40,350
Metal:					
Primary	63,326	43,627	57,434	52,571	61,624
Secondary	NA	234	[e]200	[e]200	[e]200
Total	63,326	43,861	57,634	52,771	61,824
Zirconium concentrate: Zircon, gross weight	12,180	14,820	12,400	[e]12,000	[e]12,000

See footnotes at end of table.

Table 1.—India: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982	1983[p]
NONMETALS					
Abrasives, natural, n.e.s.:					
Corundum, natural	909	1,454	1,292	1,355	714
Garnet	6,820	3,742	3,176	5,429	3,349
Jasper	3,301	4,117	3,356	2,139	5,418
Asbestos	32,094	31,253	24,515	26,761	24,873
Barite	490,699	434,015	353,362	325,368	323,000
Bromine, elemental	300	334	350	[e]350	[e]350
Cement, hydraulic thousand tons	18,264	17,700	20,760	22,498	25,400
Chalk	79,786	87,142	85,309	87,057	[e]85,000
Clays:					
Ball clay	128,090	125,457	118,635	114,782	137,917
Diaspore	6,437	5,504	6,099	5,802	6,361
Fire clay	789,291	656,279	791,105	769,495	657,000
Kaolin:					
Direct salable, crude thousand tons	379	[r]355	[r]392	531	553
Processed do.	116	[r]105	[r]114	[e]100	[e]100
Total do.	495	[r]460	506	[e]631	[e]653
Other do.	81	80	80	[e]80	[e]80
Diamond:					
Gem[e] thousand carats	14	12	14	[r]11	12
Industrial[e] do.	2	2	2	2	2
Total do.	16	14	16	13	14
Feldspar	50,157	58,610	59,395	44,854	41,837
Fluorspar:					
Concentrates:					
Acid-grade	10,991	12,349	13,346	12,407	[e]11,000
Metallurgical-grade	6,369	4,809	5,374	5,710	[e]4,590
Total	17,360	17,158	18,720	18,117	15,590
Other fluorspar materials, graded	4,081	4,049	4,185	6,785	6,993
Gem stones excluding diamond:					
Agate including chalcedony pebble	2,164	1,379	1,476	1,062	[e]1,000
Emerald, crude carats	3,760	6,600	1,000	--	--
Garnet kilograms	5,035	3,726	1,539	2,249	[e]2,000
Graphite	52,821	48,795	56,249	52,376	[e]35,000
Gypsum	877,490	[r]866,228	[r]947,663	970,365	1,039,000
Kyanite and related materials:					
Andalusite	--	--	146	536	2,573
Kyanite	40,709	46,522	38,283	33,951	38,307
Sillimanite	16,105	12,987	10,254	13,066	7,928
Lime[e]	408,000	400,000	400,000	400,000	400,000
Magnesite	[r]396,211	[r]380,113	453,410	407,071	460,000
Mica:[5]					
Exports:					
Block	1,123	[r]788	[e]1,000	[e]1,100	[e]650
Film and book for M cuttings	264	[r]328	[e]100	[e]200	[e]110
Splittings	4,155	[r]1,636	[e]3,600	[e]4,000	[e]2,300
Scrap	7,791	[r]7,077	[e]14,000	[e]8,000	[e]4,700
Powder	4,393	[r]14,005	[e]7,000	[e]5,000	[e]2,940
Manufactured	390	[r]1,752	[e]300	[e]300	[e]164
Total	18,116	[r]25,586	[e]26,000	[e]18,600	10,864
Domestic use, all forms[e]	3,000	3,000	3,000	3,000	3,000
Total mica	21,116	[r]28,586	29,000	21,600	13,864
Nitrogen: N content of ammonia[3] thousand tons	2,256	2,221	3,193	3,469	2,900
Phosphate rock including apatite	681,486	540,932	561,944	559,986	[e]600,000
Pigments, mineral, natural: Ocher	99,036	86,198	79,631	84,789	88,633
Pyrites, gross weight	67,172	83,806	57,598	55,853	63,621
Salt:					
Rock salt thousand tons	4	5	4	4	4
Other do.	7,032	8,004	8,928	7,308	[e]7,017
Total do.	7,036	8,009	8,932	7,312	[e]7,021
Sodium carbonate do.	542,297	524,644	613,000	586,800	[e]690,000

See footnotes at end of table.

Table 1.—India: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982	1983^{p}
NONMETALS —Continued					
Stone, sand and gravel:[6]					
Calcite	30,161	24,028	21,167	19,101	^{e}20,000
Dolomite thousand tons	2,077	1,887	1,955	2,133	2,264
Limestone do.	30,586	28,215	30,873	33,462	36,965
Quartz and quartzite do.	322	240	282	332	^{e}300
Sand:					
Calcareous do.	772	772	685	669	598
Other do.	1,670	1,532	^{e}1,400	1,254	^{e}1,200
Slate	19,399	11,406	9,187	4,770	^{e}5,000
Sulfur:					
Content of pyrites	26,869	33,522	23,039	22,341	25,448
Byproduct:					
From metallurgical plants^{e}	115,000	115,000	92,000	100,000	110,000
From oil refineries	3,665	5,065	4,170	5,189	3,906
Total	145,534	153,587	119,209	127,530	139,354
Talc and related materials:					
Pyrophyllite	34,708	34,102	38,420	43,602	59,042
Steatite (soapstone)	352,000	335,455	329,149	300,338	294,000
Vermiculite	3,109	3,428	3,624	2,068	^{e}2,500
Wollastonite	3,794	5,788	15,940	20,725	^{e}20,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black^{e}	54,000	NA	NA	NA	NA
Coal:					
Bituminous thousand tons	103,845	114,010	124,900	128,225	136,261
Lignite do.	3,264	4,548	5,500	6,675	7,342
Total do.	107,109	118,558	130,400	134,900	143,603
Coke:^{e}					
Coke oven and beehive do.	12,000	12,000	12,000	12,000	12,000
Gashouse do.	100	100	100	100	100
Other, soft do.	50	50	50	50	50
Total do.	12,150	12,150	12,150	12,150	12,150
Gas, natural:					
Gross million cubic feet	100,000	82,530	[3]136,067	140,000	210,550
Marketable[7] do.	66,957	50,661	[3]75,820	85,180	100,860
Petroleum:					
Crude thousand 42-gallon barrels	93,732	75,672	116,712	149,811	^{e}190,000
Refinery products:					
Gasoline do.	12,775	12,393	22,691	NA	27,100
Kerosine do.	20,440	18,440	22,529	NA	27,900
Jet fuel do.	8,760				
Distillate fuel oil do.	68,620	60,680	74,555	NA	87,200
Residual fuel oil do.	42,340	41,845	46,307	NA	53,600
Lubricants do.	2,920	^{e}57,642	2,849	NA	3,200
Other do.	36,135		42,176	NA	43,600
Refinery fuel and losses do.	10,950		13,594	NA	20,200
Total do.	202,940	^{e}191,000	224,701	^{e}240,000	262,800

^{e}Estimated. ^{p}Preliminary. ^{r}Revised. NA Not available.

[1] Table includes data available through Sept. 7, 1984.

[2] In addition to the commodities listed, other clays (bentonite, fuller's earth, and common clays), other gem stones (aquamarine, ruby, and spinel), and uranium are also produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels. In 1975, production of 6,514 metric tons of uranium ore containing about 3 metric tons of U_3O_8 was reported from two mines, which was only a part of total national production. Moreover, reported production of stone and sand and gravel are clearly only partial figures and exclude a number of types of stone; the amounts reported are inadequate to provide sufficient aggregate for production of concrete from domestically produced and consumed cement, nor do they provide for other supplies of aggregate for road metal and other construction uses.

[3] Data are for fiscal year beginning Apr. 1 of that stated.

[4] Excludes production from steel miniplants.

[5] Data supplied here (exports plus domestic use) are provided in lieu of officially reported production because the latter figures are evidently incomplete. Officially reported production figures are as follows, in metric tons: 1979—14,180; 1980—12,355; 1981—12,729; 1982—12,961; and 1983—7,364.

[6] Partial figures; for details, see footnote 2.

[7] Includes reinjected gas.

TRADE

The most important development in India's foreign trade was the continued decrease in the trade deficit. The deficit has steadily narrowed from $7.4 billion in FY 1980 to $5.1 billion in FY 1983. The trend was expected to continue in FY 1984. The improvement occurred because of the reduction in India's oil import costs, which have fallen with rising domestic production and lower international oil prices. Exports have not done as well, increasing by only $0.7 billion in value during the same period. Although world trade was improving, Indian exports were not expected to increase dramatically, given continuing constraints on electric power and uncertain conditions in India's major markets in the Middle East.

Total export value was forecast at $9.6 billion in FY 1984. Cut and polished diamonds and jewelry were the leading exports followed by crude oil and textiles. The crude oil was Bombay High oil that exceeded the refinery capacity for that type of oil. India remained a large net importer of crude oil, about 9 million tons. Net imports of crude oil and refined products in FY 1984 are estimated to cost $3.3 to $3.4 billion.[8] Fertilizers and iron and steel were the other most important mineral imports.

Exports of iron ore by the Government-owned Minerals and Metals Trading Corp. (MMTC) were expected to be about 13 million tons in FY 1983, a slight increase over that of FY 1982. Combined with the private Goan iron ore importers, the overall picture was not encouraging. Chromite and manganese ore exports were projected to decline. With all three minerals being linked to steel production overseas, particularly in Japan, the export prospects for the coming year appeared little better.

COMMODITY REVIEW

METALS

Bauxite, Alumina, and Aluminum.—There were four primary aluminum producers in the country with a total installed capacity of 362,000 tons per year. Bharat Aluminium Co. (BALCO) is a public sector enterprise, 100,000 tons per year; while Indian Aluminium Co. Ltd. (INDAL), 117,000 tons per year; Hindustan Aluminium Co. Ltd. (HINDALCO), 120,000 tons per year; and Madras Aluminium Co. (MALCO), 25,000 tons per year, are all in the private sector. Private sector producers operate with substantial foreign equity participation. Aluminum Co. of Canada Ltd. holds 50.6% of INDAL, Kaiser Aluminum & Chemical Corp. of the United States holds 26.7% of HINDALCO, and an Italian firm holds 20% of the equity of MALCO.

Although three of the companies were privately owned, control of pricing, production, and distribution policy was in the hands of the Government. Imported aluminum was made available to consumers at the same price as domestic metal by suitable fiscal adjustments. This was to protect the interests of local producers while ensuring a fair price to the consumer. By present law, over 50% of all domestic metal must be of electric conductor-grade aluminum. MMTC imports and controls the distribution of imported metal in order to maintain an assured level of supply to industry.

Indian aluminum consumption varied between 230,000 and 320,000 tons in recent years, well within the country's installed capacity. However, the industry produced at well below its capacity for a number of years, causing India to import an average of 40,000 tons per year since 1978. One major reason for the low capacity utilization was inadequate electric power supplied by the State electricity boards. In addition, the increased cost of raw materials was an inhibiting factor. The result was that the cost of production in several cases was above the Government-controlled retention price. The retention pricing system was the Government's method of keeping a tight control on the aluminum industry. A retention price was fixed for each aluminum producer on the basis of cost of production and return on capital. A sale price was also fixed by the Government. If the retention price for a particular unit was lower than the sale price, the excess amount collected had to be contributed to an aluminum regulation account. Similarly, if the retention price was more than the sale price, i.e., its cost of production was higher than the controlled price, the difference was reimbursed from the aluminum regulation account. Some companies claim that the system penalized efficiency and rewarded inefficiency.

HINDALCO, one of the more efficient operators, withheld some of the required payments from the regulation account and took the matter to court. The price of aluminum ingot reportedly was expected to be raised by approximately $300 per ton in 1984. The Government had maintained that no price revision could occur while the HINDALCO case was proceeding, so it is possible that a settlement has been reached.

Despite the problems with the electric power supply and pricing, the industry had a number of projects under construction or design in 1983, which are intended to make India an exporter of both alumina and aluminum. Toward that end, India was admitted as the 12th member of the International Bauxite Association late in the year.

By far, the largest project in the industry was the construction of the National Aluminium Co. Ltd.'s (NALCO) integrated Orissa alumina-aluminum complex. Work on the 2.4-million-ton-per-year bauxite mine at Panchpatmalli in Koraput district progressed smoothly. Preproduction drilling and overburden removal was on schedule. A $16 million turnkey contract was awarded to Cable Belt Ltd. of Camberley, United Kingdom, for the 15-kilometer, single-flight conveyor belt that would carry the ore to the 800,000-ton-per-year alumina plant at Damanjodi.

A problem came up at this point of dealing with the alumina transportation. A 100-kilometer railroad was planned from the alumina plant to Rayagada where the line would link up with an existing track for movement to Vizianagaram. There the alumina would go north to the smelter at Angul or southeast to the port at Visakhapatnam for export. However, the Damanjodi-Rayagada link, the responsibility of the railroads, was apparently not on schedule. Trucking the alumina was not considered an economically feasible alternative. A possible alternate line could be used temporarily until the Visakhapatnam steel complex comes on-stream. The line would then be needed entirely by the steel plant. Because of the widely scattered components of the complex, any breakdown of the transportation system would bring the whole operation to a stop.

Work on the smelter at Angul in Dhenkanal district dropped slightly behind schedule during the year. Labor problems were holding up some second shift construction progress. The first potline was scheduled for startup in December 1985, and full capacity was scheduled for December 1986.

Overall, it appeared that NALCO's costs have been rising, and the project was slowing down because of delays in ordering equipment, labor unrest, and rising interest rates. The interest rates increased also and the cost rose to about $2 billion, at least 25% higher than earlier estimates.

BALCO was finally able to charge part of its third potline at its Korba smelter after receiving assurances from the Madhya Pradesh Electricity Board that an additional 20 megawatts of power would be available from July onward. The third 25,000-ton-per-year potline was completed in December 1977 and was never charged because of the lack of electric power. The fourth potline completed in 1978 still awaits power from the state power company.

After preliminary construction preparations in 1982, the cornerstone ceremony for the development of a 600,000-ton-per-year bauxite mine at Gandhamardan was held on May 2, 1983. The $30 million project was scheduled for completion in 33 months. By then, BALCO's present captive Phutkapahar and Amarkantak Mines in Madhya Pradesh would be depleted. BALCO has mining leases for blocks 7-10. Total reserves at Gandhamardan were put at 212 million tons.

HINDALCO raised its smelter capacity from 100,000 to 120,000 tons per year in 1982. To feed the increased capacity the company began to expand its alumina capacity by 76% to 300,000 tons at a cost of $40 million. The work was being done under technical collaboration with Hungary. HINDALCO's subsidiary, Renusagar Power Co., commissioned its fourth turbogenerator in April 1983. This was the only Indian aluminum company with captive electric power, which contributed to its relatively high capacity utilization. The company proposed yet another large capacity increase to 187,000 tons and the installation of two more 70-megawatt turbogenerators.

INDAL's plan to merge with Mahindra and Mahindra Co. of Bombay was rejected by the Government. The merger rejection stopped INDAL's plans for installing captive power at its Hirakud smelter and installing a caustic soda plant at Halda. Funding for the new facilities would have come from the merger.

Plans for the utilization of the Kutch bauxite deposit in Gujarat progressed during the year. Gujarat Mineral Development Corp. planned to put up a 300,000-ton-per-year alumina plant. The alumina would be exported to Hungary where it would be converted into metal and shipped back to India. The plan avoids the persistent power problems plaguing the Indian aluminum industry.

Chromite.—The domestic consumption of chromite improved significantly. The increase was attributed to the commissioning of two charge chrome plants in Orissa. The Indian Metals and Ferro Alloys Ltd. (IMFA) began operating a 45,000-ton-per-year plant on February 20, 1983. Elkem A/S of Norway furnished technical collaboration and was to market the charge chrome. Ferro Alloys Corp. Ltd. (FACOR) opened its 50,000-ton-per-year plant on March 27, 1983. It was based on indigenous design and has a 10-year marketing agreement through Marc Rich and Co. of Switzerland.

IMFA continued work on a second 50,000-ton-per-year plant, which will be operated under a new company, Indian Charge Chrome Ltd. The program called for commissioning this $34 million plant in FY 1985 at Choudhar, Cuttack district, Orissa, about 20 kilometers from Bhubaneswar. Elkem would furnish technical assistance and hold 20% equity.

IMFA's plans called for setting up a 180-megawatt captive thermal powerplant to overcome the chronic power shortages. In the meantime, the power problem caused suspensions of production for several months in both the new FACOR and IMFA plants during the year.[9]

Orissa Mining Corp. was constructing a 50,000-ton-per-year charge chrome plant at Baminpol, Keonjhar district, in collaboration with Voest-Alpine AG of Austria and Outokumpu Oy of Finland.

The Government was encouraging the construction of all of these export-oriented plants, despite the power shortages, as it would result in the sale of value-added products and higher earnings from its chromium resources.

Copper.—Inadequate power supplies continued to plague copper production throughout the year. Hindustan Copper Ltd. (HCL) was able to increase smelter and wirebar output despite the power problem. However, both were well short of the planned targets. HCL was expected to show a profit in FY 1983 of about $8 million compared with losses of $30 million in FY 1982 and $43 million in FY 1981. Since it was formed in 1967, the Government-owned company had losses every year except in FY 1978. Accumulated losses totaled $160 million. HCL planned to raise the Khetri and Ghatsila smelters' capacities from 31,000 and 16,500 tons, respectively, to 45,000 and 20,000 tons per year, respectively. The plans involve a cost of about $150 million and were scheduled for completion by 1986. The Khetri expansion was to enable it to handle the concentrate from the newly opened Malajkhand Mine and concentrator.

In addition, there was a possibility of setting up a 50,000-ton-per-year smelter based on the integrated development of the Singhbhum copper belt in Bihar. In early 1983, the company issued a global tender for preliminary studies to exploit the copper deposits in the region. The first phase of the program proposes developing a new mine and installing matching concentration and refining capacity. Mosaboni, Pathargorah, Surda, and Rakha Mines already exploit some of the Singhbhum deposits.

Other copper projects underway included the development of the Nalla ore block to supplement the Dariba copper mine in Alwar district in Rajastgab, which was almost worked out, capacity expansion of the Mosaboni Mine from 50,000 to 80,000 tons per year by December 1984, and expansion of a byproducts plant for recovery of cobalt, tellurium, gold, silver, and nickel.

It was decided by HCL that the planned new refinery capacities at Khetri and Ghatsila would produce enough byproduct trace elements to warrant a new recovery facility. The existing byproduct plant at Ghatsila would be expanded and modernized to handle the load from both of the refineries. About 185 tons of anode slimes would be treated annually. The process worked out by Outokumpu envisioned recovery of 756 kilograms of gold, 10.1 tons of silver, 12.2 tons of selenium, 4.5 tons of tellurium, and about 143 tons of nickel sulfate hexahydrate.

Iron and Steel.—Iron ore production declined for the third straight year as Japanese steel mills, India's major customer, continued to suffer from lack of demand. The National Mineral Development Corp. Ltd.'s (NMDC) mechanized mines, Bailadila 5 and 14 in Madhya Pradesh and Donamalai in Karnataka, continued to operate at about one-half of their 11.5-million-ton capacity. At the same time, the stockpile of fines at the NMDC's mines reached 11 million tons in FY 1982 owing to limited successes in developing additional markets for the product. It was anticipated that the backlog of fines would be consumed when the Visakhapatnam steel plant comes online in a few years. It was designed to consume 3.4 million tons of fines and 1.9 million tons of lump ore per year.

Overall iron ore exports declined about 16% in FY 1982. A further drop of about 4% was projected for FY 1983. India has been developing alternatives to the Japanese market in recent years. These included Romania, the Republic of Korea, Italy, Taiwan, the Persian Gulf countries, the German Democratic Republic, and Czechoslovakia.

The first commercial-scale direct-reduced iron (DRI) plant began operating in March 1983 at Polasponga in Keonjhar district of Orissa. Orissa Sponge Iron Ltd. operates the 150,000-ton-per-year rotary kiln furnace. The $30 million plant was erected jointly by the Industrial Promotion and Investment Corp. of Orissa Ltd. (IPICOL) and Tor-Steel Research Foundation. The plant uses Allis-Chalmers Corp. (United States) technology. It was designed for a second kiln to be installed as needed, which would bring capacity to 300,000 tons per year. A proposal was also made to install an electric arc furnace and rolling mill for the on-site production of structural steels.

IPICOL also had plans to set up another DRI plant with Tata Iron and Steel Co. Ltd. (TISCO) collaboration. The 90,000-ton-per-year plant would be located at Joda in Keonjhar district, cost about $35 million, and be based on TISCO's domestically developed technology. The plant would operate under the name of Ipitata Sponge Iron Ltd.

Sponge Iron India Ltd.'s 30,000-ton-per-year DRI plant at Paloncha near Kothagudem in Andhra Pradesh completed 3 years of highly successful operations. The plant was set up as a joint research undertaking of the central government and the government of Andhra Pradesh, with technical know-how provided by Lurgie Chemie und Huttentechnik GmbH of the Federal Republic of Germany and M. N. Dastur & Co. Ltd., Calcutta. The plant produced a high grade of sponge iron from local raw materials and noncoking coal. The plant tested various Indian ores and coals, and its products have been successfully used in a number of electric arc furnaces around India as a substitute for scarce scrap steel. In addition, trials on iron ores from Pakistan and Hungary have been carried out to test their suitability for direct reduction, and requests have been received from Turkey, the German Democratic Republic, and Vietnam for similar tests to be carried out. Following the successful operations of the plant, the Government began its expansion to 60,000 tons per year at a cost of $8.6 million. Plant completion was scheduled for December 1984.

Taking advantage of the Government's liberalized DRI licensing policy announced in 1982, a number of parties have submitted proposals to the Department of Steel. Farthest along was a plan for a 150,000-ton-per-year facility being promoted by the Bihar State Industrial Development and Investment Corp. in collaboration with Modi Steel Ltd. of Modinager, Uttar Pradesh. The $55 million plant will be in the Singhbhum district and use Lurgie technology.

Also approved were proposals of the Maharashtra and Gujarat governments for setting up 400,000-ton-per-year natural gas-based DRI plants. The Maharashtra plant would be at Kohkan, in Raigadh district, 112 kilometers from Bombay. The Gujarat plant would be built at Hajira near Surrat. The price of the natural gas had not been decided. The plant's economic feasibility will be directly dependent on the final delivered price of natural gas.

Karnataka State Industrial Investment and Development Corp. planned to set up a DRI plant in the Hospet area. Capacity would be 150,000 tons per year, and cost would be about $50 million.

Production from the country's DRI plants will reduce India's need for imported scrap, help to extend the life of coking coal reserves, and enable the steel miniplants to produce different grades of alloy and special steels owing to the greater purity of the DRI compared with the imported scrap.

In 1983, the Steel Authority of India Ltd. (SAIL) was confronted with both new and old problems in trying to control the steel industry. Demand was down, stocks of finished steel were high and in danger of deteriorating, movement by railroad was posing the same delays and inefficiencies as in past years, output was affected by power cuts and poor quality of coal, consumers' dissatisfaction was running high, and financial losses for SAIL were expected to be in the range of $200 to $400 million depending on the sources of the figures.

In an attempt to offset some of the large losses, the Government pricing organization increased steel prices from $5 to $320 per ton effective July 24, 1983.

A major problem with sales has been that the types and amounts of steels produced had little relation to the demand for that product. Much of the success of the December sales was due to efforts being made to bring production in-line with demand. The

Government's Central Marketing Organization and the individual steelworks were now in constant touch coordinating production and sales. By yearend, production at the four main SAIL steelworks was almost entirely based on orders received or on forecasts of likely demand for specific products.

Despite the current problems, steel demand was expected to increase to 12.7 million tons by FY 1984 and further to 18.4 million tons in FY 1989. To meet the anticipated demand, the steel sector development program called for expansion and modernization of certain existing facilities and creation of new capacities. The ongoing projects aim at raising the Bhilai and Bokaro plants' crude steel capacity from 2.5 to 4.0 million tons per year each. Already delayed by 18 to 27 months, the expansion projects' cost had escalated from about $950 to $1,650 million. The delay in completion of the project was attributed to the failure of construction and major equipment suppliers to adhere to the delivery schedule. The revised schedule called for commissioning the Bhilai project by March 1984 and the Bokaro steel mill expansion in December 1984.

At Bokaro, the two new 300-ton oxygen converters were completed in 1983, bringing the raw steel capacity to the 4.0-million-ton goal. A cold-rolling mill, however, had been under construction, but the choice of equipment supplier had been pending well into the year. The U.S. firm Wean United Co. was finally chosen. The five-strand, cold-rolling tandem mill was to have a capacity of 800,000 tons per year and was due for completion in 1986. Bokaro's No. 5 blast furnace was scheduled to be completed in mid-1984.

To meet the electric power needs of these plants, the Government has approved the addition of three 60-megawatt units for each of the two plants at a reported cost of $200 million each.

A major new steel plant under construction was the Soviet-aided 3.4-million-ton-per-year plant in Visakhapatnam. Work on the project began in January 1982. The first stage (1.2 million tons) was scheduled for completion in 1986. The $3.9 billion plant received loans from the U.S.S.R. totaling $390 million, repayable in nonconvertible Indian currency over a 20-year period at 2.5% annual interest. Project funding was inadequate during the initial construction period but was stepped up, and the progress of construction should not suffer because of a lack of finance, according to the director of the project.

The private sector TISCO's program called for raising salable steel capacity from 1.5 to 2.02 million tons by 1987 in two stages. The first stage, completed in 1983 in a record 27 months, brought salable steel capacity to 1.74 million tons at a cost of $230 million. The second phase, which has already been started, was estimated to cost $300 million with a foreign exchange component of $50 to $60 million. It will consist of a new bar and rod mill, a sinter plant, a second continuous caster line, raw materials handling facilities, and additional captive power equipment. The resultant modernization and expansion will not only increase salable steel output and quality, it will produce at a lower unit cost.

Modernization programs were also underway at the Alloy Steel Plant at Durgapur and at Visvesvaraya Iron and Steel Co. in Karnataka.

Lead and Zinc.—Consumption of lead and zinc has been generally increasing in India during the past decade, but it dropped slightly in FY 1982. Imports of zinc metal declined to 55,000 tons in FY 1982, but were anticipated to be about 60,000 tons in FY 1983 to meet the projected demand of 138,000 tons. Long-term zinc demand is predicted by the Government to be 145,000 tons in 1985 and 200,000 tons by 1989; lead demand for the same period would be 65,000 tons and 84,000 tons, respectively.

To help meet these requirements, India has been investing in several projects to increase domestic output of both lead and zinc. One project was inaugurated in April 1983, the Rajpura-Dariba Mine in Rajasthan. The lead-zinc mine, 76 kilometers northeast of Udaipur in Rajasthan, has an annual capacity of 900,000 tons of ore, from which 42,000 tons of zinc, 13,000 tons of lead, 440 tons of copper, 175 tons of cadmium, and 16,000 kilograms of silver can be recovered. This is one of the world's oldest lead-zinc mining sites and was probably the deepest underground mine in ancient times. During development of the new mine, diamond drill coring recovered wood from timber supports 254 meters below the surface. Carbon dating of materials from the old stopes range from 2,300 to 3,000 years before present.[10]

The other major completion during the year was the Sargipali Mine, which was officially opened in May. It is in the Sundergarh district in the northwestern part of Orissa. This deposit too was mined in ancient times, as evidenced by underground workings and nearby slag heaps. Ore reserves were put at 2 million tons at an average grade of 6.7% lead, 0.33% copper, and 51 grams of silver per ton. Access to the blind ore body was by two inclined shafts. Fully mechanized cut-and-fill stoping were to be used to mine the ore. A standard froth flotation concentration system was incorporated for beneficiation. Annual production capacity was 150,000 tons of ore, with a planned yield of 6,560 tons of lead, 260 tons of copper, and 4,000 kilograms of silver. The mine and concentrator were to employ 670, many of them local people. Infrastructure developed with the mine was to provide all-weather transportation and considerable economic benefit to a heretofore backward area. In other developments, Hindustan Zinc Ltd. completed the expansion of its Visakhapatnam lead smelter from 10,000 to 22,000 tons per year. GSI had been conducting base metal exploration work in Rajasthan and had indicated possible commercial lead, zinc, or copper deposits in several new areas and in continuations of the Dariba area sulfide zones. GSI evaluations were continuing.

The much touted $500 million plan for developing the rich Rampura-Agucha lead-zinc deposit in Bhilwara district of Rajasthan has been postponed for lack of financial resources. The Federal Department of Mines was to try to have the project included in the seventh plan for the FY 1985-89 period.[11]

Tin.—India was not a commercial producer of tin, but the GSI had been examining several reported occurrences with the hope of possible production. A small alluvial deposit in Koraput district of Orissa contains about 350 tons of contained tin. The deposit could be panned to yield a 60% tin concentrate. Prospecting for additional reserves was underway.

GSI was scheduled to complete drilling in 1984 on a possibly commercial find of tin in the Bhivani district of Rajasthan. Tungsten and copper were also present in the 20- to 30-centimeter-wide zone of mineralization, which extended along a strike length of 400 meters. The results have encouraged GSI to increase exploration in the surrounding area.

Tin deposits were reported in 1975 in the Bastar district of Madhya Pradesh. United Nations Development Program specialists then were called in to make a detailed survey of the area. The tin reportedly occurs in a 4,000-square-kilometer area from Sukuma to Jaypore. The Government-owned Atomic Minerals Development Corp. was also involved because titanium and tungsten minerals also occur with the tin. Manual panning of the alluvial tin has been underway by the local population despite the Mining Act, which prohibits the possession or movement of tin ores. Several arrests for smuggling tin concentrates have been made in the last 2 years. One arrest reportedly involved about $50,000 worth of concentrate.

The State government and the atomic energy establishment planned to set up a pilot plant at Raipur to process tin ore from the Bastar district. The plant would cost an estimated $1 million and would attempt to develop an appropriate smelting technology to extract the more useful byproducts of tungsten, titanium, silver, and monazite.

NONMETALS

Boron Minerals.—The Regional Research Laboratory, Jammu, has reportedly developed laboratory processes for the production of several boron chemicals. India currently imports crude borax and makes boric acid using foreign technology. Development of the processes from laboratory to production stages was continuing. India's only borax deposits are in the mountainous Ladakh region in Jammu and Kashmir. Development of a completely domestic mining and processing industry would save the cost of imported boron materials.

Cement.—The Indian cement industry has gone from a condition of considerable scarcity to one of surplus since the Government's partial decontrol of cement production and distribution in February 1982. The new regulations established the categories of "levy" and "nonlevy" cement. Levy quota cement is production equivalent to two-thirds of installed capacity and must be surrendered to the Government of India for sale at the controlled price. The remaining production is classified as nonlevy and may be sold by the company on the open market. The cement companies were under a voluntary self-discipline not to charge prices exceeding the ceiling price approved by the Cement Manufacturers Association. The system worked well at maintaining cement supplies to different regions at reasonable prices.

There were additional benefits for new units built after January 1, 1982, and for units having financial difficulties. These units are allowed to sell on the open market production equal to two-thirds of capacity in the first year, 52.5% in the second year, and 50% in subsequent years. Cement plants establishing captive power facilities to meet 30% to 40% of their power requirements were allowed to sell 48.5% of their production on the open market against the standard 33.3%.

The main objectives of the policy changes were to encourage building new capacity, to generate funds for modernization, and provide a more assured power supply, and thus a higher capacity utilization. These in turn would eliminate the distribution problems and local shortages.

The Indian cement industry has grown considerably since the introduction of the new policy. Between March 1982 and December 1983, about 8 million tons was added to existing capacity, bringing total installed capacity to 36 million tons. Targeted capacity for the end of FY 1984 was 43 million tons. Nearly 90% of production came from 57 private sector factories. The Cement Corp. of India (CCI), with 10 operating units, accounted for the bulk of the public sector production. Cement production for FY 1984 was projected at 30 million tons, 4.5 million tons short of the original sixth-5-year-plan target.

Power shortages continued to be a major hindrance to efficient operation of the plants in 1983. Under the new Government incentives, 95 megawatts of captive power generating capacity has been installed and another 250 megawatts was planned or under construction. Another problem confronting the industry has been low profitability stemming from increased costs and controlled prices. The low profits cast doubt on the industry's ability to generate enough internal resources to finance the planned modernization program. The Government was considering changing the levy-free market ratio rather than increasing the price.

Despite these problems, the industry has begun an ambitious modernization and expansion program. Sixty-three out of seventy-five cement plants have modernization programs involving an investment of nearly $1.2 billion. The program calls for setting up electrostatic precipitators, cyclones, scrubbers, bag filters, and converting wet-process plants to dry-process operation. A number of expansions and new projects also were in the offing. The CCI proposes to expand its capacity from 2.7 to 6.57 million tons in the next few years. At least nine large private sector plants were under construction at yearend in addition to the CCI expansion. If the current uptrend in production is sustained in the next 2 to 3 years, India could emerge again as a net exporter of cement, a position it enjoyed until 1977.[12]

Diamond.—India has emerged as the leading processor of uncut diamonds, overtaking the traditional world leaders, Belgium and Israel. With domestic production averaging only 14,000 carats per year, the Indian diamond industry was basically engaged in importing rough diamonds, generally the smaller sizes, cutting and polishing them, and then exporting them. At the diamond cutting centers in Surat, Navsari, and Bombay, approximately 300,000 workers were engaged in diamond cutting and polishing in small decentralized cottage-scale units. It was the low wage rate of $1.50 to $5.00 per day that enabled this highly labor-intensive activity to exist, and exist profitably. The growth of the industry in the last decade has been nothing short of phenomenal. In FY 1974, 3.71 million carats of rough diamonds was imported and 1.07 million carats of polished diamonds was exported for a net foreign exchange earning of $32 million. The amounts and earnings rose steadily through the following years. In FY 1982, 4.6 million carats was imported and 4.66 million carats of polished diamonds was exported, for net earnings of $250 million. Based on 8-month figures, the projected earnings for FY 1983 were $330 million, by far India's largest mineral-based foreign exchange earner.

India's domestic production came exclusively from a volcanic pipe at Majghawan in Madhya Pradesh operated by NMDC. National diamond exploration has been underway since 1979 to locate new sources and to reexamine old diamond producing areas. GSI, Mineral Exploration Corp., and NMDC were involved with different phases of the work. Two small processing plants were set up to test ore samples, one at Panna, Madhya Pradesh, and the other at Racheria in Kurnool district, Andhra Pradesh. Several thousand tons of samples have been treated since 1982.

Fertilizer Materials.—India has been working for several years on a program to increase fertilizer production. At yearend 1983, there were 36 large fertilizer plants producing a wide range of straight nitrogenous, complex, and phosphatic fertilizers. In addition, there were about 40 small units producing single superphosphate and 6 units producing ammonium sulfate as byproduct from steel plants. The installed capacity at yearend totaled 5.17 million tons of nitrogen and 1.49 million tons of

P_2O_5.

Including plants under construction, capacity was to be increased to 7.1 million tons of nitrogen and 2.39 million tons of P_2O_5 by the end of FY 1986. This increase was to come from major expansions at Goa and Cochin and from eight new plants—Namrup III, Thal-Vaishet, Hazira, Paradeep, Mangalore, Kakinada, Haldia, and Porbunder.[13] Of this group, the only one to start production in 1983 was Haldia in West Bengal. The $360 million complex began ammonia production in July and nitrophosphate production in September. The sulfuric acid plant was scheduled to begin operating by yearend. Urea production began in August but had to be shut down within a few days because of technical problems. Strained industrial relations and a lack of coordination among top management reportedly contributed to the problems.[14]

Full production from the plants under construction would not be adequate to meet the demand by the end of the seventh plan period (FY 1985-89) of 8.5 million tons of nitrogen and 3.5 million tons of P_2O_5. A plan for an additional 2 million tons (nitrogen content) of fertilizer capacity has therefore been undertaken. Work was scheduled to start on six large natural gas-based nitrogenous fertilizer plants during FY 1983-86. The plants have been planned since 1980 and received a good deal of publicity but have been slow in tangible progress. Feasibility reports have been completed on each plant and the potential owners of each selected. Preliminary financial arrangements were being negotiated for some of the plants during 1983. Five of the plant locations were announced during 1982.[15] The sixth plant location was determined in 1983. It will be in the Sawai Madhopur district (lat. 25°59′ N., long. 76°22′ E.) of Rajasthan. All six plants will use natural gas from the offshore Bassein Gasfield as feedstock and fuel, and each will have a capacity of 1,350 tons per day of ammonia and reportedly cost over $600 million.

By yearend, letters of intent had not yet been issued for any of these projects. Only after the letters are issued can the companies sign contracts, make final commitments for funding, and acquire the land. The scheduled construction period for each plant is 36 to 38 months. The construction time for similar sized plants has taken considerably longer in many cases in India.

Production of nitrogenous fertilizer during FY 1982 fell short of the 3.6-million-ton target because of electric power shortages and failure to commission new production capacity on schedule. Capacity utilization during FY 1982 was over 67% for nitrogen and 69% for P_2O_5.

Production of phosphatic fertilizer was also important, and several new facilities were under construction or planned in 1983. One completed in October was Udaipur Phosphates and Fertilizer Ltd.'s complex at Khemli, 27 kilometers from Udaipur. The 66,000-ton-per-year single superphosphate plant operated at 100% capacity through yearend. The 33,000-ton-per-year sulfuric acid plant was scheduled to come on-stream early in 1984. Locally mined Jhamarkotra phosphate rock was the plant feed. The single superphosphate will be marketed locally.

Plans for a more efficient use of the huge Jhamarkotra phosphate deposit have been progressing satisfactorily after many years of trying to develop an economical process for using the high-silica phosphorite. The phosphorite is highly abrasive, causing rapid wear on all equipment and has a low reactivity level with sulfuric acid treatment. In recent years, only the high-grade ore (over 30% P_2O_5) has been mined from two open pit blocks and marketed with no treatment beyond crushing and screening to -12-millimeter size.

About 50 million tons of low-grade ore (14% to 22% P_2O_5) abut the high-grade material and in some places forms the overburden to the high-grade ore. Rajasthan State Mineral Development Corp. Ltd. (RSMDC), the operator of the mine, completed installation of a 200-ton-per-day pilot flotation plant at the site in November 1982. The plant has operated well on the low-grade material, yielding a 35% P_2O_5 concentrate from a feedstock averaging 16% P_2O_5. In addition, an objectionable magnesia impurity was reduced from 10% to 12% MgO to less than 1.5% MgO in the concentrate. Pilot plant changes were to continue to be made to streamline the process to develop the most efficient flowsheet and recovery.

Based on the results to date, RSMDC was contemplating the setting up of a 5,000-ton-per-day beneficiation plant. With the commissioning of the large-scale plant in mind, the company awarded a contract to conduct a 1-year feasibility study on the future development of the deposits to a consortium comprising Sofremine Géologiques et Minières, Société Française d'Études Minières, and Bureau de Recherches Géologiques et Minières of France, and Engineers of India

Ltd.

In addition to the Jhamarkotra deposit, several others were being examined. RSMDC began mining high-grade ore from a small deposit at Kanpur. Another 10 million tons of 12% to 25% P_2O_5 ore was being studied there for the possibility of upgrading the ore. RSMDC also reported new phosphate finds at Kharbaria, Lakarwas, Eklingpura, and Dakenkotra in Udaipur district and was beginning some mining on a small scale.

Magnesite.—The magnesite division of Dalmia Cement (Bharat) Ltd. (DCB) was in the process of modernizing its 72,000-ton-per-year Salem magnesite operation in Tamil Nadu. The DCB operation was one of the largest in the country. The ore has a high-silica content, but modern requirements call for a silica limit of 2.7%, which is difficult and wasteful to produce with manual sorting. After detailed laboratory testing, DCB decided that a heavy-medium separation plant coupled with froth flotation could produce suitable feedstock for high-quality dead-burned magnesite. Construction was believed to have started during the year on the 330,000-ton-per-year heavy-medium plant. Output from the plant was to be equivalent to nearly 59,000 tons of dead-burned magnesite. Because of the small density difference, control of the heavy-medium density must be precise and was to be controlled by nuclear density equipment. On completion of the plant modernization, about 800 manual laborers were to be displaced. Employment at the new facility was to require about 40 unskilled workers, leaving a net unemployment of 760 persons. This is a common problem with many Indian mining or processing plant modernizations.

Stone.—NMDC was given the task of developing a new dolomite mine to produce 660,000 tons per year of blast-furnace-grade dolomite from the 54-million-ton Kumli-Sadartara deposit in Bastar district of Madhya Pradesh. The site, also referred to as the Machkot deposit, is about 20 kilometers south of Jagdalpur. Shipping of dolomite was to start in March 1985. The output was to be used by the Visakhapatnam steel plant, currently under construction. On completion, the mine was to employ about 700 workers.

Sulfur.—India has no known native sulfur deposits. In 1983, production came from byproducts of sulfide ores and from byproduct recovery of petroleum refining. Most of India's needs, however, were filled by imports. The Government was concerned with the greatly increased cost of sulfur imports in recent years, both from an increase in the volume of imports and the increase in price.

Pyrites, Phosphates, and Chemicals Ltd. (PPCL), a Government of India company, was responsible for exploiting the country's pyrite deposits. It was making a detailed geological evaluation of the Saladipura iron pyrite (FeS_2) deposit in Sikar district of Rajasthan. The main ore body was examined with 82 boreholes totaling over 4,000 meters and further confirmed by sampling a total of 2,560 meters of drifts driven on 3 separate levels. The exploration has proven a deposit containing 37 million tons of pyrite with an in situ sulfur grade of 25.27%. The deposit has a potential of about 120 million tons. PPCL recommended to the Government the immediate exploitation of the deposit. It planned to construct a 330,000-ton-per-year sulfuric acid plant at a cost of $100 million.[16]

MINERAL FUELS

Coal.—Coal production increased substantially during the year after a shaky start because of excessive absenteeism and infrastructural problems. Daily railcar loadings in December increased to 10,394 compared with 9,268 in December 1982. Railcar dispatches are a good barometer to the output and deliveries of coal in India. Lignite production, used mainly in pitside powerplants, also increased.

After an across-the-board pay raise to Indian coal miners earlier in the year, Coal India Ltd. (CIL), the Government-owned coal company, announced a sharp rise in coal prices, effective January 8, 1984. The average increase of all grades except soft coke will be 25%. The new prices were to be valid through March 1985, and were still not expected to cover the cost of production. The remainder of the costs were to be offset by an increased subsidy to the coal sector.

The price of soft coke, used mostly by domestic consumers, was left unchanged in 1983 to avoid additional burden on the lower income people. Its selling price was about 60% of the cost of manufacture.[17]

CIL began development of a coal mine in the Manchik and Namphuk area of Tirap district of Arunachal Pradesh in far northeast India. The mine was to be the first commercial exploitation of coal in the State. The GSI confirmed 90 million tons of recoverable coal at the site, and the plans called for 100,000 tons of production in the first year.

The Nandan Coal Washery, being constructed by Western Coalfields Ltd. at the Chhindwara-based Kanhan Coalfield, began trial operations on December 25. Construction of the plant (1.2 million tons per year of throughput capacity) was completed in a record 22 months at a cost of about $24 million. It was the first coal washery constructed by Western Coalfields and was to turn out 720,000 tons of less than 17% ash coking coal for the Bhilai steel plant and 260,000 tons per year of middlings to the powerplants. Coal was to be supplied by the already operating Damua, Nandan, and Rakhikol Mines.

Two large coal development projects ran into funding problems during the year. The Kalidaspur and Kankratala Mines in West Bengal were being developed to supply coal to the 630-megawatt powerplant at Mejia (also referred to as Bankura). About $12 million had already been spent on infrastructure development in the critically power-short area. Eastern Coalfields Ltd. requested a reconsideration from CIL. Reportedly, work would resume on at least the Kalidaspur Mine by yearend.

An agreement was signed in December between Indian Iron and Steel Co. and a West German consulting firm to study the reopening of the Chasnala deep coal mine. The mine, which contains about 43 million tons of recoverable coal, produced some of the best coking coal in India up to December 1975. At that time, the mine was inundated, killing 375 miners in one of the worst mine disasters of the country. The consultant was to assess the dangers of reopening the mine and prepare a feasibility report.

Petroleum and Natural Gas.—India's second offering of exploration blocks to foreign participants attracted no foreign bidders. What the Oil and Natural Gas Commission (ONGC) had considered as more liberal terms than the first offering made in 1980 turned out to be more restrictive than the international oil companies were willing to accept. Some factions in India have been against any participation by foreign oil companies. They prefer to have all exploration done domestically and cite the singular success that ONGC had in 1974 in exploring and developing the Bombay High offshore oil and gas fields. ONGC's exploration efforts since then have resulted in no major oilfields, however. India's best prospective areas for hydrocarbons are offshore, and of these, the Krishna-Godavari Basin, 400 kilometers northeast of Madras and extending partly onshore as well, was the most promising. The International Bank for Reconstruction and Development (World Bank) provided a $165 million loan to fund a part of the basin's exploration costs. Exploration has been difficult because of strong currents, soft seabeds, and deep water. In FY 1982, five wells were drilled, and one found an emulsion of oil and water in 350-meter-deep water. Under the given conditions, this find, on its own, is not likely to be developed. Rather than being discouraged, ONGC brought in an additional drillship for the offshore areas and increased the onshore rigs from two to five.

ONGC and Oil India Ltd. also have other exploration efforts underway, both onshore and offshore. But the lack of commercial discoveries in the last few years and the lead time required to bring a new field onstream particularly guarantees that no new production of any significance besides Bombay High will be available before 1987. This means that increased Bombay High production will provide all of India's expected increase in oil production for at least the next 2 years.

In other developments, the 6-million-ton-per-year Mathura oil refinery was formally inaugurated on May 14, 1983. The Soviet-aided refinery project, built at a cost of $254 million, processes both imported oil and Bombay High oil received through a 1,085-kilometer pipeline from the offshore terminal at Salaya, in the Gulf of Kutch.

A number of other refinery expansions and improvements were underway. Expected to be completed by 1985, these projects would add 7.75 million tons per year capacity to the present 37.8 million tons. In addition, they would put the product mix more in-line with India's current needs.[18]

Contractors' bids were being solicited for the Hazira to Jagadishpur natural gas pipeline. The 1,700-kilometer pipeline was to provide feedstock for the six gas-based fertilizer plants to be set up in Madhya Pradesh, Rajasthan, and Uttar Pradesh.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Indian rupees to U.S. dollars at the rate of Rs10.0=US$1.00 for calendar year 1983. Official fiscal year values have been Rs9.00=US$1.00 in 1981, Rs9.65=US$1.00 in 1982, and Rs10.30=US$1.00 in 1983.

[3] India News. V. 22, No. 35, Nov. 28, 1983, p. 5.

[4] The New Sketch. V. 47, No. 49, Sept. 5, 1983, p. 14.

[5] Metric tons are used throughout this report.

[6] Indian fiscal year runs from Apr. 1 through Mar. 31.

[7] U.S. Embassy, New Delhi, India. State Dep. Airgram A-31, June 25, 1984, p. 6.

[8] ———. State Dep. Telegram New Delhi 02676, R060715Z, Feb. 1984, p. 1.

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[9] U.S. Embassy, New Delhi, India. State Dep. Telegram New Delhi 11928, R131131Z, June 1983, p. 1.

[10] Mining Magazine (London). V. 149, No. 5, Nov. 1983, p. 310.

[11] U.S. Embassy, New Delhi, India. State Dep. Telegram New Delhi 03306, R131302Z, Feb. 1984, p. 1.

[12] ———. State Dep. Telegram New Delhi 09407, R260808Z, Apr. 1984, p. 1.

[13] Government of India, Ministry of Chemicals and Fertilizers. Annual Report 1983-84. P. 7.

[14] Industrial Times. V. 25, No. 20, Oct. 3-16, 1983, p. 4.

[15] Kinney, G. L. The Mineral Industry of India. Ch. in BuMines Minerals Yearbook 1982, v. 3, p. 445.

[16] Forthnightly Journal of Industry and Commerce. V. 20, No. 14, July 15, 1983, p. 2.

[17] U.S. Embassy, New Delhi, India. State Dep. Telegram New Delhi 00696, R111144Z, Jan. 1984, p. 1.

[18] Government of India, Ministry of Energy, New Delhi, Department of Petroleum. Annual Report 1983-84. P. 5.

The Mineral Industry of Indonesia

By John C. Wu[1]

Indonesia was the world's largest producer and exporter of liquefied natural gas (LNG) and was 1 of the top 10 producers and exporters of crude petroleum. Indonesia was also the second largest producer of tin in the Western World, a significant producer of copper and nickel, and was becoming an important producer of cement, coal, and nitrogen fertilizer in Southeast Asia.

Despite the further softening of the world's oil prices, activities in production and exploration of Indonesia's oil and gas industries remained high. In 1983, more than 25 new oil and gas deposits were discovered onshore and offshore Sumatra, offshore East Kalimantan, and in the South China Sea. However, only three new production-sharing contracts were awarded to foreign companies for oil exploration in West Kalimantan and South Central Sumatra. The foreign oil companies operating in Indonesia were committed to spend a record high $1.2 billion[2] for exploration and were scheduled to drill 298 wells. By yearend, an agreement on a new 18-year production-sharing contract was reached between PERTAMINA and P.T. Caltex Pacific Indonesia (CPI).

Indonesia also doubled the production capacity of its LNG plants at Arun in North Sumatra and at Badak in East Kalimantan. In addition, the expansion projects of the Cilicap oil refinery in Central Java and the Balikpapan oil refinery in East Kalimantan were completed. By yearend, Indonesia's capacity of oil refining increased to more than 500,000 barrels per day.

Expansion programs of coal production in Sumatra and exploration of coal deposits in Kalimantan continued to progress. The first-phase expansion of the Ombilin Mine in West Sumatra was scheduled for completion in 1985, while the expansion program at the Bukit Asam Mine that was to begin production of coal from the Maura Tiga area by mid-1984 was moving according to schedule. In addition, a contract was awarded to a British-Canadian consortium to construct a new coal terminal at Tarahan on the southern tip of Sumatra for transport of coal to the powerplant under construction at Suralaya in West Java. To develop coal deposits in Kalimantan, one new production-sharing contract was awarded to a U.S.-Japanese joint venture firm. In October, P.T. Kideco, a Korean joint venture firm that has been exploring coal in East Kalimantan since April, announced discovery of a large coal deposit with an estimated recoverable coal reserve of 280 million tons in the Pasir area.

Activity in the nonfuel minerals sector was mixed. Production of metallic minerals remained more or less the same as that of 1982 reflecting the continuing weakness in the world markets of copper, nickel, and tin. Production of aluminum ingot by P.T. Indonesia Asahan Aluminum (IN-ALUM) of Kuala Tanjang in North Sumatra, increased to about 110,000 tons after the second-phase smelter construction was completed in late 1983. However, construction of the 600,000-ton-per-year alumina plant on Bintan Island was rephased by the Government because of a lack of national investment funds. Production of nonmetallic minerals, especially cement and fertilizer material, increased substantially after the installed capacities were expanded in the cement and fertilizer industries with strong support from the Government under the third 5-year development plan (1979-84). These two industries are expected to grow more rapidly than other nonfuels mineral industries.

In 1983, Indonesia's position on balance of payments improved slightly despite a further reduction in export earnings and continued high levels of imports. To ease the pressure on Indonesia's balance of payments, the Government of Indonesia rephased four major industrial projects, which included the Bintan alumina project in Riau ($600 million), the Musi oil refinery project in South Sumatra ($1.35 billion), the Plaju aromatic projects in South Sumatra ($1.5 billion), and the Aceh Olefin project in North Sumatra ($1.6 billion).[3] During the year, 48 out of 125 Government industrial projects in various stages of planning and execution in the sectors of manufacturing, mining, petrochemicals, agriculture, power, transportation, and communication reportedly were canceled, postponed, or rephased.

To stimulate the development of nonfuel commodity exports and to restrain imports of goods, the Government devalued the national currency—the rupiah against the dollar by 28% from 704 rupiahs to 970 rupiahs to US$1.00 on March 30, 1983. Furthermore, Indonesia continued to implement the counter-purchase policy in 1983. During 1982-83, 18 countries signed counter-purchase contracts with Indonesia valued at $741.8 million, of which $239.2 million was by the Federal Republic of Germany, $119.7 million was by Japan, $93.4 million was by the United States, and the remainder was by 15 other countries. The counter-purchase contracts involved Indonesia's purchase of fertilizers, railway freight and passenger cars, contraceptives, generators, mining equipment, and other materials from foreign countries. The commodities purchased from Indonesia by foreign countries under the counter-purchase program included clothing, crumb rubber, lumber, plywood, rice, rubber, shrimp, tea, tin, toys, and other materials.

Indonesia's gross domestic product (GDP) in 1973 constant dollars grew only 1.8% in 1983 compared with 2.3% (revised) in 1982. Slower growth rate was reported in almost every major sector of the economy. The oil and gas industry, which contributed about 25% to Indonesia's GDP in current dollars, has been experiencing negative growth for the past 2 years because of the worldwide oil glut. The nonfuel minerals industry, which contributed about 0.8% to GDP in current dollars, also experienced negative growth because of the worldwide economic recession and slowdown in new investments resulting from the latest generation of contract of work agreements. In an effort to attract investment and step up mineral exploration, the Government of Indonesia reportedly was expected to issue a new prototype contract of work under the fourth 5-year development plan that was scheduled to begin in April 1984.

PRODUCTION

Indonesia's mineral industry continued to be dominated by the mineral fuels sector. Despite a cutback in production of crude oil, progress has been made in production capacities and the output of coal and natural gas. The output of crude petroleum dropped to an average of 1.27 million barrels per day, while the output of natural gas rose slightly to 1.2 trillion cubic feet.

In the metallic minerals sector, production of bauxite, copper concentrate, and nickel matte increased slightly owing to a stronger demand from the Japanese importers. Production of nickel ore and tin was at a lower level because of weak demand for nickel from Japan and tin export control by the International Tin Council (ITC). Production of aluminum ingot increased to about 115,000 tons after the second-phase production facility came onstream in 1983. Production of gold also rose substantially as a result of increased gold recovery from the copper operation at Ertsberg in Irian Jaya.

Substantial progress was made in Indonesia's cement and fertilizer industries. The output of cement reached a new record high of 8.5 million tons with an estimated installed capacity of 10.7 million tons per year at yearend. The output of nitrogen fertilizer and triple superphosphate fertilizer also reached a new record high of 3 million tons and 1 million tons, respectively. The continued growth in these two industries was supported by the Government's third 5-year development plan.

Table 1.—Indonesia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983^{p}
METALS					
Aluminum:					
Bauxite, dry equivalent, gross weight thousand tons	1,052	1,249	1,203	704	779
Metal, primary	--	--	--	30,532	114,766
Copper, mine output, metal content	60,198	59,027	62,516	77,938	78,608
Gold metal[2] troy ounces	61,278	58,383	54,240	71,879	74,637
Iron and steel:					
Iron sand, dry basis	79,877	62,914	86,626	144,493	124,903
Metal:					
Ferroalloys, ferronickel	17,878	18,314	19,884	21,501	20,835
Steel, crude	305,000	360,000	500,000	500,000	^{e}500,000
Manganese ore	5,909	4,299	2,587	17,894	^{e}17,000
Nickel:					
Mine output, metal content[3]	^{r}37,248	^{r}53,287	48,850	45,882	^{e}46,600
Metallurgical products:					
Matte: Nickel content	^{r}8,589	^{r}20,302	19,940	13,748	18,288
Ferronickel: Nickel content	4,000	4,421	4,703	5,010	4,855
Silver, mine output, metal content thousand troy ounces	793	701	830	1,134	1,046
Tin:					
Mine output, metal content	29,535	32,527	35,391	33,806	26,513
Metal	27,790	30,465	32,429	29,755	28,390
NONMETALS					
Asbestos^{e}	--	--	5,000	^{r}25,000	25,000
Cement, hydraulic thousand tons	4,698	5,821	6,844	7,501	^{e}8,500
Clays, kaolin powder	58,539	75,558	80,904	77,207	^{e}80,000
Diamond:^{e}					
Industrial thousand carats	12	12	12	12	22
Gem do	3	3	3	3	5
Total do	15	15	15	15	27
Iodine kilograms	25,287	29,306	25,360	28,920	^{e}26,000
Nitrogen: N content of ammonia	623,207	938,455	920,213	1,027,600	1,149,100
Phosphate rock	5,323	11,191	7,846	5,031	^{e}7,000
Salt, all types thousand tons	706	690	286	799	^{e}700
Stone:					
Granite do	678	926	1,811	2,130	^{e}2,000
Limestone[4] do	6,107	7,605	8,749	11,002	^{e}13,000
Marble square meters	25,216	25,380	28,842	28,970	^{e}30,000
Quartz	127,082	260,075	155,730	977,289	^{e}900,000
Sulfur, elemental[5]	180	197	951	1,144	^{e}1,000
MINERAL FUELS AND RELATED MATERIALS					
Asphalt rock, bitumen content	91,000	173,018	276,498	330,842	^{e}350,000
Coal thousand tons	279	^{r}338	399	588	^{e}620
Gas, natural:					
Gross million cubic feet	998,457	1,045,748	1,123,720	1,111,928	1,186,362
Marketed do	398,807	695,914	720,258	926,150	1,032,321
Natural gas liquids: Propane and butane^{e} thousand 42-gallon barrels	15	15	15	14	14
Petroleum:					
Crude including field condensate do	580,447	577,016	584,838	488,167	490,483
Refinery products:					
Gasoline do	15,405	17,475	17,015	13,385	NA
Jet fuel do	59	25	--	8	NA
Kerosine do	24,217	25,988	24,052	18,947	NA
Distillate fuel oil do	18,735	19,184	17,850	14,714	NA
Residual fuel oil do	14,683	17,985	14,343	14,131	NA
Lubricants do	544	499	--	525	NA
Liquefied petroleum gas do	72	294	448	373	NA
Paraffin wax do	338	253	143	103	NA
Naphtha do	1	([6])	([6])	465	NA
Unfinished oils requiring further processing do	40,096	41,599	39,188	26,355	NA
Unspecified do	3,172	2,418	1,962	5,623	NA
Refinery fuel and losses do	3,159	3,917	3,443	4,654	NA
Total do	120,481	129,637	118,444	99,283	NA

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^{e}Estimated. ^{p}Preliminary. ^{r}Revised. NA Not available.

[1] Table includes data available through July 24, 1984.

[2] Includes Au content of copper ore and output by Government-controlled operations. Gold output by operators of so-called People's mines is not available but may be as much as 30,000 troy ounces per year.

[3] Includes a small amount of cobalt that is not recovered separately.

[4] Data represent limestone used for cement production. Excludes considerable amounts of limestone produced by enterprises under local jurisdictions for building materials, for crushed rock to be used as aggregate, and to burn for lime.

[5] Sulfur produced by other than the Frasch process.

[6] Less than 1/2 unit.

TRADE

Indonesia's merchandise trade balance continued to deteriorate in 1983. According to the Central Bureau of Statistics, overall export earnings dropped 6.7% to $15.3 billion for the first 9 months of 1983 from that of the same period in 1982, while total imports of goods jumped 10.3% to $13.1 billion. The lower export earnings from oil and LNG was the primary cause of the decline in overall export revenues. On the other hand, the higher import bill was caused by increased imports of basic materials.

During the first 9 months of 1983, exports of oil and LNG were $11.8 billion, accounting for 77% of overall export earnings, while exports of other mineral commodities were valued at $620 million, accounting for 4% of overall export earnings. Japan was the major buyer of Indonesian crude oil, LNG, aluminum ingot, bauxite, copper concentrate, ferronickel, nickel matte, nickel ore, and tin. The United States was also a major buyer of crude oil and tin.

During the same period, Indonesia imported $5.5 billion of capital goods, $6.5 billion of raw materials, and $999 million of consumer goods. The major supplying countries included Singapore (23%), Japan (22%), the United States (15%), and the European Economic Community (14%).

Also during this period, the major trade partners of Indonesia, based on the value of two-way merchandise trade, were Japan (34%), Singapore (19%), and the United States (18%).

Table 2.—Indonesia: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	956,369	746,784	--	All to Japan.
Metal including alloys:				
Scrap	295	--		
Unwrought	--	16,028	--	All to Japan.
Semimanufactures	615	192	--	Singapore 186.
Cobalt: Oxides and hydroxides	--	4	--	All to Hong Kong.
Copper:				
Ore and concentrate	197,146	191,749	--	Japan 172,935; Republic of Korea 18,814.
Metal including alloys, all forms	296	1,169	--	Malaysia 769; Singapore 400.
Iron and steel:				
Iron ore and concentrate, excluding roasted pyrite	2,400	11,000	--	All to Japan.
Metal:				
Scrap	--	134	--	Do.
Pig iron, cast iron, related materials	82,045	117,080	--	India 69,995; Japan 47,085.
Semimanufactures:				
Bars, rods, angles, shapes, sections	24,859	(2)	--	All to West Germany.
Universals, plates, sheets	8	100	--	All to Singapore.
Wire	58	--		
Tubes, pipes, fittings	1,050	1,951	--	All to Singapore.
Castings and forgings, rough	17	784	--	Japan 776.
Lead:				
Ore and concentrate	2,435	--		
Metal including alloys, all forms	181	--		
Manganese: Ore and concentrate[3]	30,062	8,400	--	Taiwan 4,800; Japan 3,600.
Nickel:				
Ore and concentrate	842,045	721,518	--	All to Japan.
Matte and speiss	44,947	37,951	--	Japan 29,273; Netherlands 8,678.
Metal including alloys, all forms	221	30	--	All to Singapore.
Tin:				
Ore and concentrate	1,044	1,473	--	Malaysia 783; United Kingdom 365; West Germany 325.
Metal including alloys:				
Scrap	750	--		
Unwrought	32,128	28,610	--	Singapore 15,705; Netherlands 8,210; West Germany 1,645.
Zinc: Metal including alloys:				
Scrap	181	511	--	Japan 411; Australia 100.
Semimanufactures	80	168	--	Taiwan 150.
Other: Ashes and residues	1,667	1,754	--	Japan 1,155; Taiwan 275; Singapore 223.

See footnotes at end of table.

Table 2.—Indonesia: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	11	52	--	All to Hong Kong.
Grinding and polishing wheels and stones	6	148	--	Do.
Barite and witherite	10,644	2,829	--	All to Singapore.
Cement	453,961	206,734	--	Bangladesh 152,127; Singapore 47,909; India 5,300.
Chalk	383	--		
Clays, crude:				
Bentonite	4,932	6,909	--	Philippines 2,116; Singapore 1,651; Malaysia 1,530.
Kaolin	9,310	2,063	--	Japan 1,105; Philippines 900; Pakistan 58.
Unspecified	2	2	--	Mainly to Taiwan.
Fertilizer materials: Manufactured:				
Ammonia	22,556	7,640	--	Philippines 4,606; Republic of Korea 2,127; Thailand 375.
Nitrogenous	[r]16,782	45,033	--	All to Philippines.
Iodine	10	18	--	France 9; India 7.
Phosphates, crude	300	520	--	All to Taiwan.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	935,717	714,099	--	All to Singapore.
Worked	--	4	(2)	Singapore 3.
Limestone other than dimension	260	--		
Quartz and quartzite	801	5,880	--	All to Japan.
Sand other than metal-bearing	4,263	17,669,255	--	All to Singapore.
Sulfur:				
Elemental: Colloidal, precipitated, sublimed kilograms	270	--		
Sulfuric acid	26	--		
Other: Slag and dross, not metal-bearing	--	81	--	All to Taiwan.
MINERAL FUELS AND RELATED MATERIALS				
Coal: Anthracite and bituminous	156,695	210,739	--	Malaysia 101,729; Japan 64,377; Bangladesh 21,000.
Gas, natural, liquefied thousand tons	11,786	9,866	114	Japan 9,720.
Petroleum:				
Crude thousand 42-gallon barrels	373,165	426,892	79,103	Japan 205,803; Singapore 63,374; Trinidad and Tobago 19,007.
Refinery products:				
Liquefied petroleum gas do	[r]1,295	4,349	1,517	Japan 2,248; Singapore 258.
Mineral jelly and wax do	20	2	--	All to Singapore.
Kerosine and jet fuel do	47	8	--	NA.
Distillate fuel oil do	19	24	--	NA.
Lubricants do	33	(2)	--	All to Singapore.
Nonlubricating oils do	--	125	--	NA.
Residual fuel oil do	37,278	19,547	2,297	Japan 16,119; Republic of Korea 1,130.

[r] Revised. NA Not available.

[1] Table prepared by Audrey D. Wilkes.

[2] Less than 1/2 unit.

[3] Includes manganiferous iron ore and concentrate.

Table 3.—Indonesia: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	50	45	--	All from Japan.
Oxides and hydroxides	39,859	66,110	98	Australia 39,435; Japan 17,099; China 3,030.
Metal including alloys:				
Scrap	60	42	--	Australia 21; Spain 20.
Unwrought	21,161	33,677	280	Australia 6,977; Canada 6,011; Spain 5,568.
Semimanufactures	25,168	27,621	812	Japan 6,421; Philippines 3,187; France 2,969.
Arsenic: Oxides and acids	71	66	--	Republic of Korea 25; Belgium-Luxembourg 12; United Kingdom 10.
Beryllium: Metal including alloys, all forms kilograms	--	4	4	
Chromium:				
Ore and concentrate	147	10	--	All from Japan.
Oxides and hydroxides	416	315	79	United Kingdom 73; Japan 55; U.S.S.R. 37.
Cobalt: Oxides and hydroxides	17	63	6	Japan 41; United Kingdom 12.
Copper:				
Matte and speiss including cement copper	50	502	--	Japan 475; Singapore 27.
Sulfate	394	196	--	Italy 110; Japan 60; Belgium-Luxembourg 24.
Metal including alloys:				
Scrap	1	36	--	All from West Germany.
Unwrought	14,993	18,119	--	Japan 8,830; Zambia 7,182; Republic of South Africa 1,402.
Semimanufactures	10,731	11,311	297	Japan 7,691; Australia 1,257; West Germany 826.
Gold: Metal including alloys, unwrought and partly wrought thousand troy ounces	716	1,028	--	Switzerland 572; United Kingdom 399; West Germany 33.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	701,574	121,039	--	Brazil 121,018.
Pyrite, roasted	112,650	178,786	--	All from Sweden.
Metal:				
Scrap	62,693	226,894	33,989	Australia 77,322; Hong Kong 27,348; Republic of Korea 17,475.
Pig iron, cast iron, related materials	74,897	84,022	5	China 27,346; Republic of Korea 20,634; Japan 12,755.
Ferroalloys:				
Ferrochromium	30	5	(2)	Japan 3; Sweden 2.
Ferromanganese	2,744	5,680	--	Taiwan 2,882; Australia 1,450; China 541.
Ferrosilicon	3,360	7,335	(2)	Philippines 2,542; Taiwan 1,816; China 1,360.
Unspecified	[r]96	496	(2)	Taiwan 266; Japan 203.
Steel, primary forms	498,986	222,413	112	Republic of Korea 68,490; Mozambique 14,428; Hong Kong 43,881.
Semimanufactures:				
Bars, rods, angles, shapes, sections	227,934	281,364	3,744	Japan 244,808; Singapore 7,103; Republic of Korea 5,564.
Universals, plates, sheets	1,217,099	1,231,953	18,334	Japan 861,626; Republic of Korea 155,482; Australia 29,588.
Hoop and strip	46,393	35,381	246	Japan 22,615; Australia 9,407; Republic of Korea 1,327.
Rails and accessories	10,429	15,362	33	Japan 12,501; Republic of Korea 1,605; Netherlands 733.
Wire	20,658	14,290	41	Japan 7,579; United Kingdom 1,340; Republic of Korea 1,174.
Tubes, pipes, fittings	275,929	416,085	49,966	Japan 248,058; Singapore 78,270; West Germany 11,407.
Castings and forgings, rough	9,975	13,815	1,297	Singapore 4,694; Japan 3,224; China 1,080.
Lead:				
Oxides	1,023	1,238	7	Australia 494; Mexico 224; West Germany 215.
Metal including alloys:				
Scrap	66	174	--	Taiwan 108; Japan 48.
Unwrought	8,082	11,422	10	Australia 9,951; Taiwan 670; Malaysia 270.
Semimanufactures	[r]172	223	1	China 114; Taiwan 67; Hungary 26.
Magnesium: Metal including alloys:				
Unwrought	32	28	--	Norway 17; Netherlands 7.
Semimanufactures	54	50	3	China 45.

See footnotes at end of table.

Table 3.—Indonesia: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Manganese:				
Ore and concentrate	9,513	4,890	--	Singapore 4,799; Japan 54.
Oxides	11,926	17,284	--	Singapore 13,994; Japan 2,838; China 398.
Mercury 76-pound flasks	696	524	26	China 240; West Germany 125; Japan 104.
Molybdenum: Metal including alloys, all forms kilograms	3,630	670	5	Taiwan 293; Netherlands 204; Hungary 75.
Nickel: Metal including alloys:				
Unwrought	12	48	--	All from Japan.
Semimanufactures	4,329	1,824	--	Republic of Korea 666; West Germany 453; Japan 428.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	15,979	482	418	Japan 64.
Rare-earth metals including alloys, all forms	28	395	--	Japan 390.
Silver:				
Ore and concentrate[3] kilograms	1,199	--		
Waste and sweepings[3] value	--	$748	--	All from Singapore.
Metal including alloys, unwrought and partly wrought troy ounces	[r]1,608	1,508	305	Japan 965; Singapore 238.
Tin:				
Ore and concentrate	151	--		
Oxides	10	12	--	All from Japan.
Metal including alloys:				
Unwrought kilograms	64,788	2,271	583	United Kingdom 854; Japan 739.
Semimanufactures	88	396	(2)	France 279; Japan 53; Singapore 45.
Titanium: Oxides	9,945	11,797	1,336	Japan 4,191; West Germany 3,079; Australia 1,602.
Tungsten: Metal including alloys, all forms	1	2	1	Singapore 1.
Uranium and/or thorium:				
Ore and concentrate	156	--		
Oxides and other compounds	225	485	12	France 190; China 60; Netherlands 21.
Metal including alloys, all forms	150	139	--	Australia 58; China 44; Taiwan 36.
Vanadium: Oxides and hydroxides	6	5	3	United Kingdom 1.
Zinc:				
Oxides	313	795	(2)	China 626; West Germany 84; Japan 50.
Metal including alloys:				
Scrap	1,050	167	--	Australia 84; Singapore 83.
Unwrought	65,376	65,626	--	Australia 50,382; Canada 6,666; Peru 3,592.
Semimanufactures	1,235	1,374	189	Taiwan 431; China 290; Norway 76.
Other:				
Ores and concentrates	1,228	1,155	--	Australia 576; China 507; France 70.
Ashes and residues	61	9	--	All from France.
Base metals including alloys, all forms	1,422	86	(2)	China 75.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	341	327	44	Japan 200; India 50.
Grinding and polishing wheels and stones	2,677	2,354	41	China 1,229; Japan 522; Taiwan 221.
Asbestos, crude	27,062	18,764	117	Canada 9,987; Australia 2,880; China 1,925.
Barite and witherite	25,863	70,833	12,342	Thailand 57,179.
Boron materials:				
Crude natural borates	405	185	85	Japan 100.
Oxides and acids	2,204	676	636	France 18.
Bromine kilograms	[r]9	78	78	
Cement	366,011	494,888	13,000	Republic of Korea 150,416; Philippines 135,925; Singapore 63,864.
Chalk	46	20	(2)	Mainly from West Germany.
Clays, crude:				
Bentonite	19,529	30,679	28,081	Singapore 1,260; Japan 299.
Chamotte and dinas earth	363	90	--	All from Japan.
Kaolin	13,688	13,218	2,750	Japan 5,016; Australia 2,935; Thailand 800.
Unspecified	3,848	4,720	188	China 1,745; Japan 1,210; Thailand 500.

See footnotes at end of table.

Table 3.—Indonesia: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Cryolite and chiolite	690	3,940	--	All from Japan.
Diamond:				
Gem, not set or strung value, thousands	$14	--		
Industrial do	$15	--		
Diatomite and other infusorial earth	435	179	54	Republic of Korea 60; Japan 50.
Feldspar	13,133	10,653	--	China 4,548; India 3,199; Thailand 1,125.
Fertilizer materials:				
Crude, n.e.s	2,019	9,404	16	Jordan 8,000; Netherlands 1,355.
Manufactured:				
Ammonia	34	163	4	France 149.
Nitrogenous	472,478	376,268	75,215	Romania 86,625; U.S.S.R. 59,508; Republic of Korea 40,660.
Phosphatic	296,349	259,441	74,194	Tunisia 52,504; Romania 50,000; Jordan 30,516.
Potassic	237,081	223,767	79	West Germany 129,561; Canada 43,078; U.S.S.R. 25,982.
Unspecified and mixed	1,427	10,937	10	West Germany 6,923; Belgium-Luxembourg 2,047; Republic of Korea 1,000.
Graphite, natural	191	231	--	Republic of Korea 100; Japan 49; Taiwan 46.
Gypsum and plaster	316,158	294,350	(2)	Australia 178,203; Thailand 92,445; Japan 19,023.
Iodine	26	40	7	United Kingdom 26.
Lime	504	567	55	United Kingdom 219; Singapore 205; Taiwan 50.
Magnesium compounds: Magnesite	2,580	3,613	--	Japan 2,892; China 400; Taiwan 320.
Mica:				
Crude including splittings and waste	389	587	142	China 255; India 70; Japan 44.
Worked including agglomerated splittings	147	197	27	Japan 52; India 34; China 32.
Nitrates, crude	1,002	901	--	All from West Germany.
Phosphates, crude	260,592	294,730	63,998	Jordan 135,350; United Arab Emirates 30,055; Morocco 24,777.
Pigments, mineral:				
Natural, crude	441	351	--	China 340.
Iron oxides and hydroxides, processed	2,197	2,410	67	China 1,023; West Germany 649; Japan 428.
Potassium salts, crude	100	--		
Precious and semiprecious stones other than diamond: Natural value, thousands	$16	--		
Pyrite, unroasted	499	--		
Salt and brine	492	668	51	West Germany 457; Thailand 43; United Kingdom 27.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	89,976	97,600	29,889	Kenya 22,700; Japan 18,682; Romania 12,317.
Sulfate, manufactured	11,530	13,380	3,245	Taiwan 5,950; Japan 1,958; China 1,892.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	27	546	(2)	West Germany 467; Singapore 61.
Worked	1,570	2,466	(2)	China 983; Italy 575; Taiwan 562.
Dolomite, chiefly refractory-grade	1,670	4,356	256	Japan 3,475; Taiwan 600.
Gravel and crushed rock	1,212	1,716	162	France 938; Japan 442; Malaysia 100.
Limestone other than dimension	100	173	20	Malaysia 100; Japan 51.
Quartz and quartzite	513	257	--	China 100; Japan 100; Netherlands 44.
Sand other than metal-bearing	2,318	3,286	681	Netherlands 1,447; Taiwan 488; Malaysia 238.
Sulfur:				
Elemental:				
Crude including native and byproduct	10,398	3,413	--	Japan 1,666; Republic of Korea 986; Taiwan 580.
Colloidal, precipitated, sublimed	89,526	82,805	(2)	Canada 56,442; Singapore 24,130; Taiwan 659.
Dioxide	7	8	(2)	Mainly from Australia.
Sulfuric acid	2,264	1,391	87	Singapore 1,274.
Talc, steatite, soapstone, pyrophyllite	12,880	17,338	129	China 13,981; Republic of Korea 965; Singapore 711.
Other:				
Crude	5,450	3,705	3	Japan 1,514; China 825; Republic of Korea 600.
Slag and dross, not metal-bearing	23,195	14,166	934	Japan 11,835; Singapore 598; Australia 373.

See footnotes at end of table.

Table 3.—Indonesia: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	19,964	16,745	740	Singapore 7,086; Japan 5,700; Taiwan 1,541.
Carbon: Carbon black	26,790	27,621	176	Australia 15,443; Malaysia 3,432; Japan 3,215.
Coal: All grades including briquets	5,373	2,772	503	Republic of Korea 2,000.
Coke and semicoke	27,689	28,218	12	Japan 13,375; Taiwan 5,465; Republic of Korea 4,602.
Peat including briquets and litter	--	45	--	All from Finland.
Petroleum:				
Crude thousand 42-gallon barrels	17,572	26,925	--	All from Saudi Arabia.
Partly refined do.	90	1,053	10	Singapore 999.
Refinery products:				
Liquefied petroleum gas 42-gallon barrels	1,404	485	76	Japan 261; Singapore 101.
Gasoline:				
Aviation thousand 42-gallon barrels	2,741	153	(2)	Mainly from Singapore.
Motor do.	1,945	8,775	--	Singapore 6,759; Philippines 1,618.
Mineral jelly and wax do.	29	47	2	China 25; West Germany 7.
Kerosine and jet fuel do.	[r]5,280	17,074	(2)	Singapore 16,484; Philippines 547.
Distillate fuel oil do.	2,756	4,304	--	Singapore 3,888; Philippines 340.
Lubricants do.	598	695	192	Singapore 285; Japan 103.
Nonlubricating oils do.	570	617	9	Singapore 323; Australia 223.
Residual fuel oil do.	3,942	9,959	--	Singapore 9,889.
Asphalt do.	794	1,619	(2)	Singapore 1,466; Taiwan 98; Japan 53.
Bitumen and other residues do.	1,136	28	(2)	Singapore 18; Taiwan 4; Republic of Korea 2.
Bituminous mixtures do.	42	60	5	Singapore 50.
Unspecified (white spirit) do.	1,676	739	--	Mainly from Singapore.

[r] Revised.

[1] Table prepared by Audrey D. Wilkes.

[2] Less than 1/2 unit.

[3] May include other precious metals.

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—Production of bauxite by P.T. Aneka Tambang (P.T. Antam) from Bintan Island increased slightly to 750,000 tons. Exports of bauxite to Japan totaled 731,331 tons in 1982 and about 800,000 tons in 1983.

According to the 10-year contract, which expired in 1983, Indonesia was to export 1.2 million tons of bauxite to Japan annually. By yearend, a new 5-year contract was signed between P.T. Antam and four Japanese alumina smelters including Nippon Light Metal Co. Ltd., Showa Light Metal Co. Ltd., Sumitomo Aluminum Smelting Co. Ltd., and Mitsui Aluminum Co. Ltd. Under the new contract, P.T. Antam was to export a total of 4 million tons of bauxite to Japan over 1984-88 with the first year delivery of up to 870,000 tons.

In May 1983, the planned construction of the 600,000-ton-per-year alumina plant on Bintan Island was halted by the Indonesian Government as part of the rescheduling of four major industrial projects owing to insufficient investment funds. In September, the Government decided to cancel the construction contract with the Klöckner Industrie-Anlagen of the Federal Republic of Germany and reportedly was to pay $17.5 million in compensation for the value of the services already provided by Klöckner.[4]

Production of aluminum by IN-ALUM totaled 30,532 tons in 1982, of which 16,028 tons was exported principally to Japan. The 1983 planned production was 110,000 tons, of which about 98,600 tons was to be exported to Japan. According to a Japanese source, the price of Indonesian aluminum ingot was reduced to $1,400 per ton in early 1983 from $1,539 per ton in 1982.

The second-phase construction work on IN-ALUM's smelting complex and hydroelectric powerplant was completed by yearend. The aluminum smelter at Kuala Tanjung now has two reduction plants with a combined annual capacity of 150,000 tons of aluminum ingot. Each plant contains 170 reduction pots where alumina was converted into aluminum by electrolysis. When the third reduction plant is completed in 1984, the smelter will have a combined annual capacity of 225,000 tons. At the Kuala Tanjung smelter site, space is available for possible expansion of two additional reduction plants.[5]

The Asahan hydropower project, which used the water current of the Asahan River from Lake Toba in North Sumatra, was completed in April 1983. The Sigura-gura and Tangga powerplants, equipped with a total of eight generators, have a combined installed capacity of 603 megawatts and a peak capacity of 513 megawatts. In 1984, about 450 megawatts will be required for the aluminum smelter, and the remaining 63 megawatts will be distributed to the community in the surrounding areas. By yearend, the power supply reportedly had reached Kisaran and Indrapura of the Asahan regency and Tebing Tinggi near Kuala Tanjung.

Copper.—A record high output of copper and a slight improvement in the world copper market have resulted in a substantial increase in profits of Freeport Indonesia Inc., from $1.2 million in 1982 to $12.7 million in 1983. The copper ore production from the Ertsberg East underground mine was raised to 9,500 tons per day and the open pit averaged 3,000 tons per day. The milling throughput also reached a new record high at 10,250 tons per day. As a result, a record high output of 78,608 tons of copper metal was produced in 1983.[6]

At the Ertsberg East Mine, the mining method of block caving was changed to a load-haul-dump (LHD) extracting system in the second half of 1982 because of the coarse caving characteristics of the ore body. Technically, the caved ore was not fracturing naturally into small fragments suitable for slushers when block caving was used. The conversion of block caving into the LHD system eliminated the technical difficulties and increased ore output of the underground mine. At the Ertsberg open pit mine, mining was at a 350-meter depth with output ranging between 2,000 and 3,000 tons per day. The estimated recoverable ore is expected to be depleted in 1986 or 1987 at the rate of 2,000 tons of ore per day starting in 1984.

For better utilization of the existing expensive infrastructure of the Ertsberg complex, Freeport Indonesia was undertaking a $43.6 million capital project to increase its copper output of the underground operations.

The capital project included $5.6 million for the first-phase expansion of the underground mine output from 9,500 tons per day to 10,500 tons per day, $21 million for development of a new caving level to lift the underground mine output further to 12,000 tons per day, $5 million for a new primary crusher, and $12 million for modification of the concentrator to increase retention time and throughput as well as to raise the concentrate grade to 45% copper and mill recovery rate to 94%.[7]

In 1982, a total of 3.5 million tons of ore was mined from the Ertsberg copper complex with an average ore grade of 2.6% copper. The mill produced 223,704 tons of copper concentrate averaging 34.84% copper with 9 grams of gold and 144 grams of silver per ton of concentrate. Freeport Indonesia exported 228,800 tons of copper concentrate principally to Japan. The export values were estimated at $118.5 million with an average price of copper at 67.45 cents per pound in 1982.[8]

P.T. Tropic Endeavor Indonesia, a joint venture firm of P.T. Antam and Utah Exploration Inc. of the United States, reportedly has completed a preliminary feasibility study for the development of a porphyry copper deposit within the Tombulilato district of the Block II contract area in North Sulawesi. The study concluded that it was not considered viable. Further studies on alternative development, including optimization of mine design and metallurgical processing, identification of optimum infrastructure requirements, evaluating concurrent development of more than one deposit, and evaluating underground mining, are needed for a possible development project to produce 30,000 to 50,000 tons per year of copper metal and 2 to 5 tons of gold per year.[9]

Gold and Silver.—Gold production by P.T. Antam from its Cikotok Mine in South Banten in West Java increased 23% to about 8,800 troy ounces, while silver production from the same mining area decreased by 36% to about 62,500 troy ounces. Gold and silver recovered as byproducts of copper mining by Freeport Indonesia at the Ertsberg Mine in Irian Jaya reportedly increased in 1983.

In 1982, the output of gold and silver from the Cikotok Mine in South Banten was

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7,159 troy ounces and 98,314 troy ounces, respectively, while gold and silver contained in the output of copper concentrate produced from the Ertsberg Mine was estimated at 64,719 troy ounces and 1,035,670 troy ounces, respectively.

Iron and Steel.—Iron sands production from the Cilacap area decreased slightly. Iron sands production in the Palabuhanratu Mine was worked out and closed down in April 1982. In 1982, the output of iron sands from the Cilacap area was 139,606 tons and only 4,887 tons from the Palabuhanratu area. Domestic consumption of iron sands, mainly by the cement industry, totaled 107,430 tons, and about 11,000 tons was exported.

In February 1983, P.T. Krakatau Steel completed its second-phase steel mill project. The Indonesia state-owned steel producer now has an annual capacity of reducing 2.3 million tons of direct-reduced iron, 1 million tons of steel slab, 1 million tons of hot-rolled strip and plate, 550,000 tons of billet, 220,000 tons of wire, 150,000 tons of concrete reinforcing bar, 85,000 tons of channels and beams, and 20,000 tons of black or galvanized wire. According to a company official, the plants were operating at 60% capacity during the second half of 1983 and depended almost entirely on imports of iron ore pellets from Brazil and Sweden for its direct-reduction plant.

Construction of the 850,000-ton-per-year cold-rolling mill in Cilegon was scheduled to start in late 1983 by a consortium of Secim SA, Creusot Loire S.A., Equipment Sidérurgique of France, and Española de Coordinación Técnica Financiera S.A. of Spain, with production technology of United States Steel Corp. financed by a $6 million loan from the Export-Import Bank of the United States. The project was scheduled for operation in the last quarter of 1986. The required 950,000 tons of raw materials will be supplied by the 1-million-ton-per-year hot-strip mill of P.T. Krakatau. Indonesia's demand for cold-rolled steel sheet was expected to reach 1.06 million tons in 1985 and 1.58 million tons in 1990. Indonesia has imported from Japan all of its cold-rolled steel sheet requirements, which was estimated at 750,000 tons per year in the 1982-83 period.[10]

Nickel.—Nickel ore production by P.T. Antam from the Pomalaa area of Southern Sulawesi and Gebe Island declined to about 1.4 million tons. Production of ferronickel also declined slightly because of reduced exports to Japan during 1983. In 1982, P.T. Antam produced a total of 1,640,922 tons of nickel ore, of which 724,117 tons was from the Pomalaa area and 916,805 tons was from Gebe Island. During 1982, the company exported 1.06 million tons of nickel ore to Japan. The Pomalaa ferronickel plant produced 21,500 tons of ferronickel (containing 5,010 tons of nickel), of which 18,648 tons was exported mainly to Japan in 1982.

Production of nickel ore and nickel matte by P.T. International Nickel Indonesia (P.T. Inco) from its Soroako complex in South Sulawesi increased slightly owing to a stronger demand for nickel matte by two Japanese nickel oxide producers—Tokyo Nickel Co. Ltd. and Nippon Nickel Co. Ltd. As a result, production of nickel matte was at about 50% to 55% of the 35,000-ton-per-year capacity during the second half of 1983.

P.T. Inco had an accumulated total loss of $321.3 million at the end of 1982 because of high debt, servicing costs, the low nickel price, and the low rate of production for the past 3 years. In November 1982, the company reportedly offered to sell 20% of its equity to the Indonesian Government at $55 per share; however, the Indonesian Government was unable to acquire the 20% equity owing to the difficult economic situation and budgetary constraints during the 1982-83 period. In an effort to reduce the annual interest cost, which was about $50 million for a total debt of $480 million and principal repayments of about $250 million, International Nickel Co. Ltd. of Canada (Inco Ltd.), the parent company, reportedly was arranging a prepayment of 25% of P.T. Inco's total debt held by banks and other lenders, with the remainder to be repaid as it matures.[11]

Tin.—Indonesia's tin production continued to decline because of export controls imposed by the ITC. The 1983 production was estimated at 27,000 tons, which was about 22% below the production target under the Indonesian third 5-year development plan (1979-84). However, Indonesia remained the second largest tin producer in the Western World. P.T. Tambang Timah (P.T. Timah), the state-owned tin mining company, that produced over 75% of Indonesia's tin output, reportedly was hit hardest by the ITC's export restrictions. A number of P.T. Timah's dredges were idled, but no layoff of emloyees was reported.[12]

Tin production in Indonesia by company and area for 1981-82 was as follows, in metric tons:

Company and area	1981	1982
P.T. Tambang Timah:		
Bangka Island	19,609	18,446
Belitung Island	6,364	6,468
Singkep Island	1,135	1,250
Bangkinang, Sumatra	70	54
P.T. Koba Tin:		
Koba, Bangka	6,581	5,471
P.T. Broken Hill Proprietary Indonesia:		
Kelapa Kampit, Belitung	522	648
P.T. Riau Tin Mining:		
Tujuh Riau Island	1,110	1,469
Total	35,391	33,806

Production of refined tin at the Mentok tin smelter (Peltim) on Bangka Island declined slightly to 28,390 tons in 1983 from 29,755 tons in 1982. In Indonesia, all tin ore and concentrate produced by the four tin producers was smelted at Peltim.

In October, construction of Indonesia's first tin-plating plant was started by the newly established P.T. Pelat Timah Nusantara, a joint venture firm of P.T. Timah, P.T. Krakatau, and P.T. Nusantara Ampera Bakti. The $96 million tin-plating plant was being constructed by a consortium of Mannesmann Demag Sack of the Federal Republic of Germany and Hitachi Zosen Co. Ltd. of Japan at Cilegon in West Java. Kaiser Engineers International, a unit of Raymond International Inc. of the United States, reportedly was providing consulting services, and the project is partly financed by a loan from Morgan Guaranty Trust Co. of the United States. The 130,000-ton-per-year capacity plant was scheduled to come on-stream in 1986. According to an Indonesian tin industry official, in 1983 Indonesia imported about 119,000 tons of tinplate for domestic consumption, of which 113,500 tons was consumed by the canning industry.[13]

NONMETALS

Cement.—Production of cement increased to about 8.5 million tons owing to the expansion of the industry's production capacity and the continuing growth in domestic demand. However, because of the delay in construction of various Government projects (mostly buildings), about 224,000 tons of surplus cement was exported to Bangladesh, Malaysia, Singapore, and Sri Lanka.

On August 2, the 1-million-ton-per-year capacity cement plant of P.T. Semen Andalas Indonesia was officially opened by the President of Indonesia at Lhok Nga in Aceh, North Sumatra. The cement plant, equipped with a modern combustion system, was built by a Japanese consortium composed of Mitsubishi Corp. and Kobe Steel Ltd. under a turnkey contract. In addition, special harbor infrastructure, storage, and packing units have been constructed at Lhok Nga and Belawan. The project took 3 years to complete and cost about $200 million. The cement company is a joint venture firm of P.T. Rencong Aceh Semen, the Blue Circle Industries PLC of the United Kingdom, and Cementia Holding AG of Switzerland.

By yearend, P.T. Semen Padang had added a 600,000-ton-per-year capacity to its 930,000-ton-per-year cement plant at Indarung in West Sumatra under its Indarung III-A expansion programs. During 1983, P.T. Semen Cibinong reportedly also added a 50,000-ton-per-year capacity to its 1.2-million-ton-per-year plant at Narogong in West Java. A new minicement plant, with an annual capacity of 60,000 tons per year, was completed at Kupang, Nusa Tenggara, on Timor Island by Loesche GmbH of the Federal Republic of Germany. The miniplant was operated by P.T. Semen Kupang, a joint venture company of P.T. Semen Gresik, the Provincial government of Timor, and the Indonesia State Development Bank.

Indonesia's cement production in 1982 and the estimated annual capacity for 1983 by company were as follows, in thousand metric tons.[14]

Company	1982 production	1983 estimated capacity
P.T. Indocement	[1]2,349.2	3,500
P.T. Semen Padang	971.2	1,530
P.T. Semen Gresik	1,403.1	1,500
P.T. Semen Tonasa	457.2	620
P.T. Semen Cibinong	1,232.7	1,250
P.T. Semen Andalas Indonesia	--	1,000
P.T. Semen Baturaja	331.6	500
P.T. Semen Nusantara	755.8	750
P.T. Semen Kupang	--	60
Total	7,500.8	10,710

[1] Includes 68,566 metric tons of white cement.

Fertilizer Materials.—Indonesia's chemical fertilizer industry continued to grow under the current 5-year development plan (1979-84). The second unit of the triple superphosphate fertilizer plant under the phase-one expansion program of P.T. Petrokimia Gresik came on-stream in mid-1983. The plant was built by a French contractor, Spie Betignolles, and financed by a $78 million French loan, $40 million in local funds from the company's funds, and a loan from Bank Negara Indonesia. Construction of the 500,000-ton-per-year fertilizer plant started in August 1981 and was completed in 2 years. According to a company official, about 350,000 tons of phosphate rock and 600,000 tons of phosphoric acid will be imported annually to feed the fertilizer plant.

To reduce the import dependency of raw materials, P.T. Petrokimia reportedly acquired a 40,000-ton-per-year capacity phosphate mine in East Java. In addition, the company has awarded a contract to Hitachi Shipbuilding & Engineering Co. Ltd. of Japan to build an 810-ton-per-day aluminum sulfate plant, a 410-ton-per-day aluminum fluoride plant, a 1,800-ton-per-day cement retarder plant, a 1,800-ton-per-day sulfuric acid plant, and a 610-ton-per-day phosphoric acid plant to produce the raw materials for the triple superphosphate fertilizer plant. These plants were scheduled for completion by the end of 1984.[15]

In November 1983, construction work on the P.T. Asean-Aceh Fertilizer's plant was completed by Toyo Engineering Corp. of Japan and began production of urea and ammonia at Lhokseumawe in Aceh. The nitrogen fertilizer plant has a daily capacity of 1,725 tons of urea and 1,000 tons of ammonia. According to a company official, the plant was expected to operate at near capacity. The $400 million fertilizer plant is the first of the Association of South East Asia Nations joint industrial projects to come on-stream, and the output of urea will be distributed as follows in 1984: Indonesia, 250,000 tons; Malaysia, 100,000 tons; the Philippines, 80,000 tons; Thailand, 80,000 tons; and the remainder to Japan and Singapore.[16]

MINERAL FUELS

Coal.—Coal production by the state-owned coal company P.N. Tambang Batubara (P.N. Batubara) increased slightly to 486,000 tons in 1983. The output from the Bukit Asam Mine declined to about 160,000 tons, while the output from the Ombilin Mine increased to 326,000 tons. In 1982, the total output of coal by P.N. Batubara was 480,987 tons, of which 302,572 tons was from the Ombilin Mine and 178,415 tons was from the Bukit Asam Mine. The configuration of domestic coal consumption in 1982, by end use, was as follows, in metric tons:

Railroad	15,162
Cement plants	132,458
Tin mining and smelting	24,700
Nickel mining and smelting	13,100
Coal mining	45,518
Other	15,418
Total	246,356

According to Indonesia's 1982 Mining Yearbook published by the Department of Mining and Energy, coal has been produced by two private companies—C.V. Baiduri Enterprise and C.V. Fajar Bumi Sakti in East Kalimantan since 1978. The total coal production by the two companies was 34,000 tons in 1980, 48,421 tons in 1981, 107,000 tons in 1982, and 161,000 tons in 1983. Most coal from the area was exported to Japan, the Republic of Korea, and the Philippines. During 1983, export of coal from East Kalimantan reportedly reached 121,480 tons, of which 84,600 tons went to Japan and the remainder went to Hong Kong, the Republic of Korea, Malaysia, and Taiwan.[17] Exports of coal from the Ombilin Mine in West Sumatra was about 150,000 tons in 1983. Bangladesh, the Republic of Korea, and Malaysia remained the major buyers. In addition, Vietnam reportedly also imported about 10,000 tons of coal from the Ombilin Mine.

The Ombilin Mine, which was implementing the Ombilin I expansion project in Sawahlunto, West Sumatra, planned to raise output to 750,000 tons in 1985. In June 1983, P.N. Batubara signed a $13 million contract with C. Itoh & Co., of Japan to lease mining equipment for the Ombilin I open pit project. In August, the state-owned coal company signed another contract valued at $29 million with Dowty Meco Ltd. of the United Kingdom to purchase a complete transportation system, equipment for the construction and support of mine tunnels, ventilating equipment, pumps, and work safety equipment for use in the Ombilin Mine. In addition, a request for proposals for the Ombilin II expansion project was sent to seven foreign companies including Dravo Engineering Inc. and The Fluor Corp. of the United States. The Ombilin II expansion project is to develop an underground mine in the nearby Waringin region with an annual capacity of 650,000 tons by the late 1980's. The proposed project, to be funded by the International Bank for Reconstruction and Development (World Bank), called for preparation of a detailed feasibility study, review of previous studies of the mine, and analysis of field data, as well as investigation of shipping facilities.[18]

The Bukit Asam Mine was undergoing a $1.4 billion expansion at its Maura Tiga and Air Laya deposits. The Maura Tiga deposit, an open pit mining operation, is scheduled to produce at the rate of 20,000 tons per month in mid-1984 and gradually increase to 70,000 tons per month in 1986. The mining operation will cease entirely in February 1987 after producing about 2 million tons of coal. A small portion of coal production from the area will be marketed domestically; however, a large portion of the 2 million tons will be stockpiled at a new coal terminal that will be constructed at Tarahan on the southern tip of Sumatra by mid-1985. The Suralaya powerplant, which was under construction in West Java, will receive the stockpiled coal from the Tarahan terminal to test its boilers and generator when the powerplant becomes operational in 1985. The Air Laya deposit, also an open pit mining operation, was scheduled to produce 3 million tons per year in 1986. About 2.4 million tons will be consumed by the 800-megawatt powerplant at Suralaya, and the remainder is to be consumed partially by a new generator at the minesite and partially by the Baturaja cement plant in South Sumatra.[19]

In May 1983, a contract for construction of a new coal terminal at Tarahan in Lampung, South Sumatra was signed between P.N. Batubara, Dominion Bridge Co. of Canada, and Belfour Beatty Sakti of the United Kingdom. The value of the contract was estimated at $68 million.

To develop coal deposits in East Kalimantan, another production-sharing contract was signed between P.N. Batubara and a joint venture firm of Mobil Oil Corp. of the United States (60%) and Nissho-Iwai Corp. of Japan (40%) in April. P.T. Berau Coal, established by the joint venture firm, was to develop a coal concession of 487,217 hectares along the Berau River in East Kalimantan. This was the seventh production-sharing contract that Indonesia signed with foreign companies to engage in coal exploration and development in Kalimantan.

P.T. Kideco Jaya Agung, established under a production-sharing contract signed between Indonesia and a consortium from the Republic of Korea led by Samchuk Consolidated Coal Mining Co. in 1982, started coal exploration in April 1983 and discovered a coal deposit in the Pasir area of East Kalimantan in October. According to the Korea Mining Promotion Corp. of the Republic of Korea, the coal reserves in the area were estimated at 683 million tons, of which about 280 million tons is recoverable with an average heating value of 6,250 calories per gram. The Korean consortium reportedly has invested about $3.2 million in exploration and planned to invest an additional $70 million before production begins at the rate of 2 million tons per year in 1986.[20]

Petroleum and Natural Gas.—According to monthly statistics of Indonesia's petroleum and natural gas industry, production of crude petroleum dropped to an average 1.27 million barrels per day in 1983 from 1.34 million barrels per day in 1982. During 1983, the output of crude petroleum (excluding condensate) was slightly under the production ceiling of 1.3 million barrels per day imposed by the Organization of Petroleum Exporting Countries in April 1982. However, the output of natural gas increased slightly to 1.19 trillion cubic feet in 1983.

Production of crude petroleum was from 5,107 wells in 224 oilfields onshore and offshore in Indonesia. According to Indonesia's Department of Mining and Energy, as of June 1983, there were 39 foreign oil companies operating on 78 contract areas in Indonesia, of which 61 contracts operated under production-sharing agreements, 11 under joint operating arrangements, 4 under contract-of-work agreements, and 2 under technical assistance agreements. During the second half of 1983, Indonesia's PERTAMINA signed three production-sharing agreements with Elf Aquitaine Indonesie Marawai, Total Ouest Kalimantan of France, and Asamera Oil Indonesia of Canada.[21] Despite the fewer numbers of new exploration contracts signed in 1983, 298 exploratory wells were to be drilled compared with 284 wells in 1982. The foreign companies were committed to spend $1.22 billion for exploration compared with $1.11 billion in 1982.

CPI and P.T. Stanvac Indonesia (STANVAC), which operated under an old contract-of-work agreement that expired in 1983, were renegotiating a new production-sharing contract with PERTAMINA. STANVAC decided to return its contract areas in Central and South Sumatra to PERTAMINA in August while CPI agreed to a new 18-year production-sharing contract with PERTAMINA in December. Under the new production-sharing contract, the production split between PERTAMINA and CPI is 88:12 for the production of crude oil and 70:30 for the production of natural gas. In addition, CPI is obliged to pay corporate taxes, taxes on interest, dividends, and royalties; CPI is to set aside 28.57% of its share of oil production for refining in Indonesia; and CPI is to invest $1.5 billion for secondary recovery pro-

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grams in the Dari Oilfield and $1.5 billion for new exploration during the 18-year contract period.[22]

In 1983, two significant new oilfields were discovered in Indonesia. In March, Natomas Co. of the United States discovered a new oilfield offshore southeast Sumatra. In April, CPI discovered another new oil deposit in the coastal plains in Riau Province, East Sumatra. Other important new oil and gas discoveries included Kerr-McGee Indonesia Inc. in the Bawean block in the eastern Java Sea; Total Indonesia in the Sepasu offshore East Kalimantan; Mobil Pase Inc. in North Aceh, North Sumatra; and Natura Oil, a joint venture of Natuna, Continental Oil Co. of Indonesia, Getty Oil Indonesia, and Gulf Oil Sumatra Ltd. in the South China Sea.

In 1983, expansion programs of two refineries were completed. The Cilicap refinery in Central Java came on-stream in August with an additional 200,000-barrel-per-day capacity, while the Balikpapan refinery in East Kalimantan was inaugurated in November also with an additional 200,000-barrel-per-day capacity. Expansion programs of the Dumai refinery in Sumatra were rescheduled for completion in 1984.

To meet the increasing demand of LNG from Japan and the Republic of Korea, Indonesia has expanded its Arun LNG plant in Aceh, North Sumatra, with two more trains and planned to build the sixth train by 1986 for export of LNG to the Republic of Korea. In addition, two more process trains were added to the Badak plant at Bontang in East Kalimantan. An explosion at the Badak LNG plant reportedly occurred on April 14 and damaged one of the operating trains. According to industry sources, 3 workers died and 35 were injured. The damaged train was shut down between April and November. As a result, some difficulties in meeting supply commitments were reported in June and July. By yearend, Indonesia had doubled its Badak LNG plant capacity to 6.4 million tons and its Arun LNG plant capacity to 7.5 million tons. In August, an agreement was finally reached after more than 2-1/2 years of negotiations between Indonesia and the Republic of Korea for Indonesia to export 2 million tons of LNG per year to Korea Electric Power Co. for a 20-year period starting in late 1986. The LNG will be supplied from the sixth process train of the Arun LNG plant in Aceh. The expansion cost was estimated at $400 million.[23]

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[1] Economist, Division of Foreign Data.

[2] Where necessary, values have been converted from Indonesian rupiahs (Rp) to U.S. dollars at the rate of Rp970=US$1.00.

[3] The Asian Wall Street Journal. V. 7, No. 173, May 9, 1983, p. 1.

[4] Harian Umum AB (Jakarta). Sept. 23, 1983, pp. 1, 7.

[5] U.S. Embassy, Jakarta, Indonesia. State Dep. Telegram Medan 00104, Mar. 10, 1983.

[6] Mining Journal (London). V. 302, No. 7748, Feb. 17, 1984, p. 115.

[7] Engineering and Mining Journal. V. 184, No. 9, Sept. 1983, p. 46.

[8] Indonesia's Ministry of Mining and Energy. Indonesia Mining Yearbook. 1982, p. 117.

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[10] Kompas (Jakarta). July 1, 1983, pp. 1, 9.

[11] Far Eastern Economic Review (Hong Kong). V. 120, No. 17, Apr. 28, 1983, pp. 63-64.
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[12] Harian Umum AB (Jakarta). Aug. 20, 1983, pp. 1, 3.
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[13] American Metal Market. V. 91, No. 226, Nov. 18, 1983, p. 5.
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The Star (Kuala Lumpur). Aug. 30, 1983, p. 33.

[14] Business News (Jakarta). Dec. 30, 1983, p. 3; Jan. 20, 1984, pp. 3-4.

[15] Japan Chemical Weekly (Tokyo). V. 24, No. 221, Sept. 1, 1983, p. 25.
Kompas (Jakarta). July 31, 1983, pp. 1, 6.

[16] Business Times (Kuala Lumpur). Nov. 28, 1983, p. 24; Dec. 1, 1983, p. 1.
U.S. Embassy, Jakarta, Indonesia. State Dep. Telegram 01319, Jan. 24, 1984.

[17] Mining Journal (London). Feb. 17, 1984, p. 111.

[18] Kompas (Jakarta). Aug. 23, 1983, p. 2.
Petroleum News (Kong Kong). Sept. 1983, p. 8.

[19] U.S. Embassy, Jakarta, Indonesia. State Dep. Telegram Medan 0470, Nov. 9, 1983.

[20] U.S. Embassy, Seoul, Republic of Korea. State Dep. Telegram 13352, Dec. 3, 1983.

[21] Business News (Jakarta). Dec. 14, 1983, p. 3.
Kompas (Jakarta). July 9, 1983, p. 2.
U.S. Embassy, Jakarta, Indonesia. State Dep. Telegram 01488, Jan. 26, 1984.

[22] Business News (Jakarta). Dec. 28, 1983, p. 10.
Petroleum Economist. Jan. 1984, p. 37.

[23] Harian Umum AB (Jakarta). Aug. 13, 1983, pp. 1, 3.

The Mineral Industry of Iran

By John R. Lewis[1]

Modest increases in the output of copper metal and steel plus dramatic increases in the output of crude petroleum were signs that Iran in 1983 was moving to restore itself from the effects of the revolution of 1978-79. The Sar Cheshmeh copper complex was apparently up to full output capacity of 145,000 tons of blister copper per year; the Gol-e-Gohar iron mine was to begin operations after extensive rehabilitation work; and the Iranian Government was interested in increasing the output of the large steel complex at Esfahan from 1.9 to 3.2 million tons per year.

Oil production continued to be the mainstay of Iran's economy. Crude oil exports accounted for one-fourth to one-third of the gross national product and nearly all of Iran's foreign exchange earnings. The country was rejuvenating its oil sector by seeking to develop new fields, enhanced secondary recovery projects, and new transportation and refining facilities. During the year, without known outside assistance, Iranian engineers finally capped the wild oil wells in the Persian Gulf. The goal for Iran's production was 3 million barrels per day (bbl/d), which would give it operating capital for many expansion projects.

The Iranian Plan and Budget Organization completed the country's first 5-year plan, to be implemented commencing with the 1983-84 fiscal year beginning March 21, 1983. Efforts were being made to complete major development projects begun under the previous Government and to resume old trading patterns.

Iran continued to pay off some of the debts it incurred in taking over oil, mineral, and other industrial entities.

PRODUCTION AND TRADE

Nonfuel mineral production in Iran continued to hold steady or to increase ever so slightly in most cases. Little or nothing of this output was exported. Production of crude petroleum and natural gas, however, were at post-revolution highs, with crude oil production averaging 2.4 million bbl/d. Iran's crude petroleum exports went primarily to Japan and Western Europe. Low-cost imports that could be hauled by rail or truck to Zahedan in Iran, a journey of about 1,250 miles, were entering the country via the port of Karachi, in Pakistan. Included in such shipments were fertilizers. Pakistan, on the other hand, was buying Iranian oil at $5 to $6 per barrel below posted prices. Iran and Canada expected to consummate a $1 billion agreement late in 1983 under which Iranian oil would be exchanged for Canadian goods and equipment.

Iran's largest trading partner by far, was Japan, which depended for about 60% of its energy requirements on Iran. In the first 9 months of 1983, Japan sold Iran $2.1 billion worth of goods, triple the sales of the same period a year earlier. A pent-up demand for spare parts and other equipment, including oil, gas, and mining machinery of many types, was creating a market for European countries, such as Sweden, which sent automobiles, trucks, and diesel engines.

Table 1.—Iran: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum metal, primary ingot	[r]11,000	[3]15,900	[3]12,500	[3]45,000	[3]45,600
Chromium: Chromite, gross weight	136,000	80,000	32,000	41,000	50,000
Copper:					
Mine output, metal content	3,000	1,000	2,000	[3]43,500	[3]48,500
Metal:					
Smelter	700	800	800	13,500	[3]23,500
Refined	3,000	1,000	1,000	[3]1,000	[3]10,000
Iron and steel:					
Iron ore, gross weight thousand tons	609	600	600	750	850
Metal:					
Pig iron do.	800	800	500	600	700
Steel, crude do.	700	700	500	550	600
Lead, mine output, metal content[e]	15,000	[r]12,000	[r]20,000	[r]25,000	[3]26,000
Manganese ore, gross weight	20,000	--	--	--	--
Zinc, mine output, metal content	25,000	30,000	35,000	[3]40,000	[3]39,000
NONMETALS					
Barite	180,000	150,000	75,000	80,000	85,000
Cement, hydraulic thousand tons	9,000	8,000	8,000	9,500	9,000
Clays:					
Bentonite[e]	20,000	20,000	10,000	11,000	10,000
Fire clay	70,000	50,000	40,000	50,000	45,000
Kaolin	160,000	150,000	100,000	110,000	100,000
Feldspar	3,000	2,500	2,000	2,500	2,600
Gypsum thousand tons	7,000	7,000	6,000	5,000	6,000
Lime[e] do.	500	500	500	550	600
Magnesite	5,000	4,000	4,000	4,000	4,500
Nitrogen: N content of ammonia	[3]183,300	217,800	200,000	210,000	225,000
Pigments, mineral, natural	1,000	500	500	600	700
Salt, rock[e] thousand tons	700	600	600	700	750
Sodium compounds: Caustic soda	20,000	NA	10,000	12,000	12,500
Stone, sand and gravel:					
Limestone thousand tons	NA	11,000	11,000	14,000	12,000
Marble do.	NA	NA	200	200	225
Silica do.	NA	NA	200	200	220
Travertine do.	NA	NA	100	100	150
Strontium minerals: Celestite[e]	8,800	5,500	5,000	4,500	4,600
Sulfates, natural:					
Aluminum-potassium sulfate (alum)	NA	NA	3,000	3,000	2,500
Sodium sulfate (mineral not specified)[e]	NA	NA	20,000	20,000	21,000
Sulfur:					
Native thousand tons	75	70	50	10	20
Byproduct of petroleum and natural gas do.	200	150	6	10	25
Total do.	275	220	56	20	45
Sulfuric acid do.	[e]100	100	70	100	150
Talc	[e]400	300	200	250	225
MINERAL FUELS AND RELATED MATERIALS					
Coal thousand tons	[e]900	700	600	700	[3]980
Coke do.	[e]400	400	350	350	400
Gas, natural:					
Gross million cubic feet	[r]1,100,000	NA	200,000	381,500	NA
Marketed do.	[r]500,000	NA	100,000	150,000	NA
Natural gas liquids, unspecified thousand 42-gallon barrels	[e]500	2,000	2,000	3,000	3,200
Petroleum:					
Crude[4] do.	[3]1,121,346	[r]550,000	692,000	873,000	[3]892,200
Refinery products:					
Gasoline:					
Aviation do.	2,500	NA	15,000	NA	NA
Motor do.	[r]30,000		4,000		
Jet fuel do.	10,000		15,000		
Kerosine do.	[r]30,000		20,000		
Distillate fuel oil do.	[r]45,000		40,000		
Residual fuel oil do.	[r]90,000		500		
Lubricants do.	3,000		NA		
Other: Asphalt do.	9,500		4,000		
Refinery fuel and losses do.	4,000		1,000		
Total do.	[r]224,000	NA	99,500	NA	235,000

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1] Reported data are for years beginning Mar. 21 of that stated, except those for natural gas and petroleum, which are for regular calendar years. Table includes data available through June 1, 1984.

[2] In addition to the commodities listed, other types of crude construction materials (such as common clays, sand and gravel, and other varieties of stone) are produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

[4] Excludes petroleum reinjected into fields.

COMMODITY REVIEW

METALS

Aluminum.—Completion of a project to increase the output of the Iranian Aluminium Co. smelter at Arak, in central Iran, progressed during 1983 to the midway point. Some production was expected in 1984 and completion was targeted for March 1986. Although there was no estimate of final cost, by mid-1983, about $45 million had been spent on the project. Production of primary aluminum during the year, at this, Iran's only aluminum plant, amounted to about 46,000 tons. This was only slightly more than the output reported for 1982.

Copper.—There were indications during 1983 that the Sar Cheshmeh copper complex of the National Copper Industries of Iran in Kerman Province was accelerating its refined copper output. Mining, concentrating, smelting, and refining activities all take place at the complex in southeastern Iran. Production of ore from the mine began in December 1981, was about 70,000 tons per year in 1982, and was up to full capacity of 145,000 tons per year by yearend 1983. The mine had cumulatively produced 8.6 million tons of 1.2% ore by yearend. Proven reserves were stated to be 450 million tons of 1.2% ore, with additional probable reserves calculated to be about 800 million tons. The concentration complex, still under development, was about 45% complete.

Sar Cheshmeh's smelter was producing blister copper by midyear at a capacity of 145,000 tons per year. The material was being stockpiled in readiness for full operation by the refinery. No concentrates or blister copper were exported during the year. Plans were announced to expand blister copper production from 145,000 to 165,000 tons per year.

Technical complications were hampering production of refined copper, but their solution appeared imminent. When this facility is operating at capacity, output will be about 145,000 tons of copper metal per year plus 800,000 tons per year of sulfuric acid.

A small amount of copper ore was mined at a place identified as Minakan. Production in 1983 was about 4,000 tons.

Gold.—The producing capacities of two relatively small gold mines in the Muteh area of Esfahan Province were to be enlarged, according to plans announced during the year. Average output of 10,000 ounces of gold per year was expected during the life of the mines. Negotiations were underway for installation of equipment to process 200 to 400 tons of ore per day.

Iron and Steel.—The Kudremukh iron ore project at Karnataka, India, was partially funded by Iran before the 1978-79 revolution. The intention was that Kudremukh would be a major supplier of iron ore concentrates and pellets to Iran's growing steel industry. At midyear 1983, it was announced that, after a long period of inactivity, Iran had agreed to buy Kudremukh iron ore concentrates, with shipments to start early in 1984. The Kudremukh Mine had a reported production capacity of 7.5 million tons per year of iron ore.

In Iran, the Gol-e-Gohar iron mine project, work on which was suspended at the time of the revolution, was being started up again. The Swedish firm, Gränges Engineering AB, had developed plans and programs for the project in the 1974-78 period. The company in 1983 was reengaged as the main technical consultant, and the project was being resumed based on the old arrangement. New design and engineering plans were being drawn up by Gränges. Total reserves of magnetite ore at Gol-e-Gohar were estimated[2] at 650 million tons. A production rate of 5 million tons per year of iron ore was planned. Open pit operations were to begin in 1988 to coincide with the startup of operations of the Mubarakeh steelworks.

The Ahwaz steel mill, which had been inoperable since 1979, partly because of its closeness to the Iran-Iraq conflict, was under study for resumption of construction of abandoned HyL direct-reduction facilities. The Mexican company, Hojalata y Lámina S.A. (HYLSA), stated early in 1983 that it had signed a contract with the National Iranian Steel Industries Corp. to resume HyL plant work. The contract covered technical support during construction and commissioning of the plant and was to include training and technical assistance and engineering services for the pelletizing plant, direct-reduction plant, melting shop, and continuous caster. There were indications that some of the iron ore from Kudremukh would be destined for use at Ahwaz. In 1983, the Ahwaz plant produced about 250,000 tons of raw steel.

Another big direct-reduction plant was projected at Iran's largest steelworks at Esfahan, in central Iran. Capacity of the National Iranian Steel plant in 1979 was 1.9 million tons of steel per year. The project addition would bring the plant's capacity to 3.2 million tons per year.

One of the largest industrial complexes in latter-day Iran was the planned Mubarakeh steel complex near Esfahan. To cost about $4.7 billion, the plant was scheduled to begin operation in 1988. The plant would have an announced annual capacity of 2.4 million tons of iron sheets, ranging from 0.3 to 16 millimeters in thickness. A contract was awarded to an Italian firm in 1977 for the equipment for the plant, and about 40% was installed by 1983. Completely self-sufficient for fuel, the plant will operate on domestic natural gas instead of coal. Indications were that the owner, National Iranian Steel, expects to amortize the cost of the plant over a 5-year period.

Negotiations between Iran and Turkey to barter Iranian oil for Turkish steel semimanufactures and pipe were undertaken during 1983. About 600,000 tons of steel was involved. Greater need for food, medicine, and armament forced the Iranian Government to pare down its order to about 210,000 tons.

Lead and Zinc.—The National Iranian Lead and Zinc Co., with assistance from Belgian experts, was proceeding with plans to build a lead-zinc facility at Zanjan in northern Iran. Raw materials for the plant would come from the Auguran lead and zinc mine, 75 kilometers to the west of Zanjan. The plant's capacity was variously reported as being between 40,000 and 60,000 tons per year of both lead and zinc. The intention was to begin construction during 1983 and have the plant fully operational in 5 years. One announcement estimated a work force of 2,000 to 4,000. Cost was to be about $300 million.

A smaller plant, at Sorb Abad, near Tehran, was being readied to produce about 15,000 tons of lead annually.

Iran was, upon its application for membership, made a full member of the International Lead and Zinc Study Group during 1983.

NONMETALS

Salt.—The production of salt in Iran in 1983 was estimated at about 750,000 tons. A $10 million salt farm to produce solar salt near Bandar Shahpur would normally supply 500,000 tons per year, which was to be used mostly as a source of chlorine for the giant Iran-Japan Petrochemical Co. Ltd. plant nearby. Because of delays in completing the plant, salt production was lower. The Mining and Metallurgical Co. of Iran was producing about 5,000 tons of salt per year at Eyiranbey Garmsar, and the Iran Barite Co. was said to be engaged in drilling for underground salt at the Anabal Mine in Khuzestan.

MINERAL FUELS

Natural Gas.—An ambitious project to build a distribution system to supply natural gas to 3 million potential customers in 450 communities was approved by the Government during 1983. Gas reserves were slightly more than 480 trillion cubic feet, keeping Iran second only to the U.S.S.R. in natural gas reserves. The new system, when completed, will use 4.6 billion cubic feet of gas per day. The National Iranian Gas Co. will be required to build 10,000 miles of main lines and another 16,800 miles of distribution lines. The first export line, built a number of years ago, IGAT I, and a 56-inch line, IGAT II, will become the backbone of the system. Both will be involved exclusively in serving domestic requirements, with much of the gas coming from the Kangan and Nar Gasfields.

Work on a $1.6 million pressure maintenance project for a number of southern Iran oilfields was resumed in 1983. Four hundred and twenty-five million cubic feet of gas per day was to be injected back into the 11 producing fields' reservoirs to improve ultimate oil recovery.

Petroleum.—*Production.*—Crude oil production in Iran averaged 2.4 million bbl/d during 1983, up about 400,000 bbl/d from that of 1982. Daily average production fluctuated mildly, ranging from a high of 2,816,000 bbl/d in January to a low of 2,160,000 bbl/d in March. Production during the early summer was up, usually 2.5 to 2.7 million bbl/d. Monthly differences usually were not more than 10%. The country's crude reserves remained high, with more than 55 billion barrels of proved reserves. In March, the Organization of Petroleum Exporting Countries (OPEC) agreed on a marker price of $29.00 per barrel. Iran, in turn, was offering certain buyers a $2 per barrel discount to encourage buyers to risk their ships in Iranian waters.

Refining.—According to the International Petroleum Encyclopedia, crude oil refining capacity in Iran on January 1, 1983, was 530,000 bbl/d. The Iran News Agency reported that, for the 30 days ending June 21, refineries located at Esfahan, Lavan, Shiraz, Tabriz, and Tehran were operating at a rate of 624,000 bbl/d, about 15% above their combined rated capacity. This much petroleum would be very close to equaling domestic requirements for the various products consumed by Iran.

One small refinery, at Masjed-e Soleyman, which had been inoperative for a number of years, went back on-stream during the year producing aromatics, motor fuel, and diesel oil.

Transportation.—An extension, from Yazd to Kerman, of the Esfahan-Yazd petroleum products pipeline was commissioned in February. At the outset, about 430,000 bbl/d of kerosine and diesel fuel was moving through the line.

To counter the threat of military action against oil tankers passing through the Strait of Hormuz, Iran was giving consideration to building a 750-mile crude line from the Gach Saran Oilfield via the Gurreh pump station opposite the Kharg Island oil terminal down to the Port of Jask on the Indian Ocean outside the Strait of Hormuz. The project was in the very early discussion stage in 1983.

Petrochemicals.—The Iran-Japan Petrochemical Co. Ltd. complex at Bandar Khomeini (85% completed) remained viable, but inactive, during 1983. Resumption of construction, scheduled to begin on January 1, 1984, was announced in late 1983 by the owners, the Iran Chemical Development Co. (the Mitsui & Co.-led Japanese group), which was a 50% partner with the Iranian National Petrochemical Co. The intention to resume work followed a payment to Japanese interests of $11 million in overdue interest on loans for the project. A large team of technical personnel was to examine the complex's war damage during the spring of 1984. However, the Japanese interests were advised by the Iraqis that the plant might be further attacked, and Mitsui then stated that construction work would not resume as long as there was any danger.

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[1] Physical scientist, Division of Foreign Data.
[2] Mining Journal. Nov. 25, 1983, p. 386.

The Mineral Industry of Iraq

By George A. Morgan[1]

The mining sector was dominated by crude oil production, which increased to about 1 million barrels per day compared with 850,000 barrels per day in 1982. However, total output was only about 25% of total capacity. The country was reported to have the third largest reserves of oil in the world at 65 billion barrels.

The war with Iran continued into its fifth year. The Majnoon Oilfield on the border with Iran was threatened with shutdown from Iranian forces. Destruction of berthing facilities in the Persian Gulf has resulted in high priority development of new pipelines and transportation routes. New pipelines were planned through Jordan, Saudi Arabia, and Turkey; expansion of the existing line through Turkey, which accounted for nearly all of Iraq's crude oil exports, was expected in 1984. New expressways were being constructed for high-speed connection with Jordan, Kuwait, Syria, and Turkey. Several railroads were being constructed. One was to connect Baghdad with Al-Qaim and Akashat and was due for completion in 1984. Another was to run from Kirkuk to Haditha. A line connecting Musayyib and Samowa was also under construction.

Iraq's electric power generating capacity was adequate for current demand. Electricity output in 1982 was 13 billion kilowatt hours, up from 2.3 billion kilowatt hours in 1972. Installed generating capacity was estimated at 4,000 megawatts, of which 1,500 megawatts was from gas-fired turbines. Operating capacity was about 3,000 megawatts, with 1,000 megawatts idled by the war. Dam projects underway were expected to expand hydroelectric power, which will contribute 25% of total electric power output.

Government Policies and Programs.—Owing to the sharp decline in oil revenues, the Government instituted austerity measures to cope with low financial reserves in 1983. Refinancing of the debt with France was obtained, and Iraq sought to defer payment on services provided by Japanese trading houses. Other countries from which relief was asked were the Federal Republic of Germany, Italy, the Republic of Korea, and the United Kingdom. Settlement in some instances involved payment in oil rather than hard currency. The Government also sought to cut nonessential imports, and by yearend, total imports were estimated to be 50% of the 1982 level.

PRODUCTION AND TRADE

Production data for most mineral commodities was not reported. Output was estimated on the basis of best available information. Personnel requirements for the war resulted in shortages of skilled workers for the industry, and operation of some plants was to be contracted to foreign firms. Trade data was unavailable. The total value of oil exports was estimated at $10.2 billion in 1982, the latest year available.[2]

Table 1.—Iraq: Production of mineral commodities[1]

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Iron and steel:					
Sponge iron metric tons	280,000	210,000	40,000	[e]40,000	--
Steel, crude do.	352,000	260,000	45,000	[e]45,000	--
NONMETALS					
Cement, hydraulic thousand metric tons	5,100	5,500	5,600	[e]5,600	5,600
Gypsum[e] do.	165	170	170	170	170
Nitrogen:					
N content of ammonia do.	450	500	80	[e]80	80
N content of urea do.	250	300	50	[e]50	50
Phosphate rock do.	--	--	[e]50	363	1,199
Salt do.	90	90	80	[e]80	80
Sulfur, elemental:					
Native, Frasch do.	550	700	145	[r] [e]200	300
Byproduct[e] do.	40	40	40	40	40
Total do.	590	740	185	[r] [e]240	340
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural:					
Gross million cubic feet	560,000	430,000	401,173	[e]400,000	400,000
Marketed[3] do.	78,751	79,000	62,154	[e]60,000	60,000
Natural gas liquids:					
Natural gasoline thousand 42-gallon barrels	1,250	[e]250	400	[e]400	400
Propane and butane do.	3,000	[e]3,000	990	[e]1,000	1,000
Petroleum:					
Crude do.	1,252,000	968,582	326,000	[e]310,000	400,000
Refinery products:					
Gasoline do.	9,900	10,000	NA	NA	NA
Jet fuel do.	2,310	3,000	NA	NA	NA
Kerosine do.	NA	NA	NA	NA	NA
Distillate fuel oil do.	15,180	17,000	NA	NA	NA
Residual fuel oil do.	16,830	18,500	NA	NA	NA
Lubricants do.	330	400	NA	NA	NA
Other do.	9,900	10,000	NA	NA	NA
Refinery fuel and losses do.	6,600	8,100	NA	NA	NA
Total do.	61,050	67,000	75,000	[r] [e]75,000	100,000

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Includes data available through May 23,1984.

[2] In addition to the commodities listed, lime and a variety of crude construction materials (clays, sand and gravel, and stone) are also produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3] Includes reinjected, if any.

COMMODITY REVIEW

NONMETALS

Fertilizer Materials.—The fertilizer complex at Al-Qaim in western Iraq reached limited production following technical problems in startup. Production capacity was to be 250,000 tons per year of monoammonium-phosphate and 272,000 tons per year of mixed nitrogen-phosphorus-potassium fertilizer. A 50,000-ton-per-year ammonium plant, also at Al-Qaim, was the source for nitrogen. Potash was imported from Jordan. Phosphate was supplied from the Akashat Mine, southwest of the plant. Sulfur for the sulfuric acid plant, also at Al-Qaim and operational in 1982, was from the Mishraq Mine.

Sulfur.—The Mishraq Mine south of Mosul continued to produce sulfur, but at a rate well below design capacity of 1 million tons per year. Shipments of sulfur via the Port of Umm Qasr were terminated in 1980 because of war damage. Sulfur was then exported overland by tanker. India was reported to have purchased 50,000 tons from the State Organization for Minerals in 1982, but recent trade data were not available. Previous export markets were India and Poland.

MINERAL FUELS

Natural Gas.—Tenders were submitted at yearend for construction of a 30,000-barrel-per-day crude oil degassing facility for the East Baghdad Field. Gas from the plant will be used in the Daura powerplant. Reserves of natural gas were reported to be 20.8

trillion cubic feet.

Petroleum.—Crude oil continued to be shipped via the 980-kilometer-long pipeline through Turkey from Kirkuk to Ceyhan on the Mediterranean coast. The 1977 design capacity of the pipeline was 650,000 barrels per day, but was increased to over 700,000 barrels per day in 1983 through the use of chemical additives. A further capacity increase was underway to raise total throughput to 1 million barrels per day.

In addition to exports of 700,000 barrels per day via Turkey from Iraq, 300,000 barrels per day was exported for Iraq's account from Saudi Arabia and the Kuwait-Saudi Arabia neutral zone as part of a swap arrangement. Iraq was to supply an equivalent amount of oil from its field following the end of the war.

Several proposals were offered for expanding exports via pipeline. One proposal involved construction of a pipeline to Saudi Arabia to link the Saudi Petroline, which would increase export capacity by about 450,000 barrels per day. Another proposal involved the construction of a pipeline through Jordan.

Iraq signed a $1.2 million contract with Snam Progetti S.p.A. of Italy for a feasibility study and detailed design of a 3-million-ton-per-year natural gas liquids pipeline from Kirkuk to Yumurtalik on the Mediterranean coast of Turkey.

Crude oil refining capacity increased to 400,000 barrels per day from about 300,000 barrels per day prior to 1980 owing to the partial commissioning of a new refinery complex at Baiji. The Saluhaddin I refinery had 70,000 barrels per day capacity and the northern refinery had 150,000 barrels per day capacity. Total production of oil products was estimated at 350,000 barrels per day. Iraq exported refined products by tanker truck to ports in Jordan and Turkey. Tanker transport via the 1,000-kilometer-long route from the Baiji refinery to Iskenderun in Turkey was at the rate of about 7 million barrels per year.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Iraqi dinars (ID) to U.S. dollars at the rate of ID0.311=US$1.00.

The Mineral Industry of Ireland

By Joseph B. Huvos[1]

In 1983, Ireland suffered its third successive year of negligible growth, and the gross national product remained unchanged from that of 1982. Unemployment climbed to over 16%. The slump also had its effect on the mineral industry, although during the second half of 1983, the world economic recovery aided some operations. Offshore exploration received a major boost by a significant discovery of substantial oil and gas flows in the Celtic Sea Basin. Other important events included startup of an alumina plant, recommissioning of a magnesia plant, and near-capacity operation at the country's only remaining metallic ore mine. Ireland's location within the European Economic Community and the availability of a well-trained English-speaking work force was attractive to U.S. investors, and the Irish Government continued to vigorously encourage U.S. investments.

The total expenditure for exploration was estimated at about $5 million.[2] The number of licenses issued was 432, down from 542 in 1982. Aquitaine Mining (Ireland) Ltd. and a number of other companies increased their activity. Glencar PLC proposed to explore the Tatestown-Scallanstown and Liscarton prospects northwest of Navan. Significant lead-zinc mineralization was found there and also in the Harberton Bridge area in County Kildare. Munster Base Metals Ltd., a subsidiary of Anglo United Development Corp. Ltd., has carried out further drilling of gold prospects at Tullibuk near Contibret, County Monaghan. Barite and base metals were also attracting interest in Donegal and southeast Leinster. Tara Prospecting Ltd. continued work on talc-magnesite deposits near Westport, County Mayo. Further stimulation of exploration was caused by the release by the Geological Survey of Ireland of previously confidential company data covering ground surrendered under the terms of prospecting licenses.

PRODUCTION

Of major importance during 1983 was the record-breaking near-capacity operation of Tara Mines Ltd.'s Navan Mine, aided by the favorable dollar exchange rate. All construction or steel industry-related minerals—like the production of cement, magnesia, and gypsum—suffered from slack demand. Alumina figured among the country's products for the first time. Offshore oil drilling increased substantially.

Table 1.—Ireland: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982	1983^{p}
METALS					
Alumina	--	--	--	--	65,980
Copper, mine output, metal content	4,900	4,200	3,500	1,600	--
Iron and steel: Steel, crude thousand tons	72	2	32	55	^{e}10
Lead, mine output, metal content	71,000	59,000	30,500	39,000	34,000
Silver, mine output, metal content thousand troy ounces	1,059	771	596	352	308
Zinc, mine output, metal content	212,300	228,700	120,300	167,200	186,000
NONMETALS					
Barite	328,300	259,947	273,900	265,800	199,300
Cement, hydraulic thousand tons	2,067	1,868	1,938	1,580	1,486
Gypsum do.	417	382	359	371	352
Lime	73,000	31,700	46,100	46,500	^{e}45,000
Nitrogen: N content of ammonia thousand tons	171	254	291	^{e}250	295
Pyrites	29,354	25,000	25,600	13,800	--
Sand and gravel[3] thousand tons	7,168	5,376	5,400	6,497	NA
Stone and other quarry products:					
Limestone[3] do.	11,101	11,945	9,721	11,831	NA
Other[3] [4] do.	3,882	3,694	3,040	3,126	NA
Sulfur: S content of pyrites	13,050	11,250	^{e}11,250	^{e}11,250	NA
MINERAL FUELS AND RELATED MATERIALS					
Coal, anthracite and bituminous thousand tons	62	63	70	63	75
Coke, gashouse including breeze do.	41	40	^{e}40	^{e}40	^{e}40
Gas, natural: Marketed million cubic feet	NA	32,205	49,087	72,324	77,485
Peat:					
For agricultural use thousand tons	91	88	81	95	NA
For fuel use:					
Sod peat[5] do.	1,653	1,688	1,584	1,680	NA
Milled peat[6] do.	2,013	2,738	3,774	3,599	NA
Total do.	3,666	4,426	5,358	5,279	NA
Peat briquets[7] do.	325	338	340	406	NA
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	4,412	4,152	1,589	960	2,661
Jet fuel do.	252	155	60	--	--
Distillate fuel oil do.	4,566	4,019	1,418	1,084	2,798
Residual fuel oil do.	7,075	5,981	2,200	1,308	2,951
Liquefied petroleum gas do.	260	238	211	155	58
Naphtha do.	126	35	14	3	17
Refinery fuel and losses do.	574	408	NA	NA	NA
Total do.	17,265	14,988	5,492	3,510	8,485

^{e}Estimated. ^{p}Preliminary. NA Not available.

[1] Table includes data available through Aug. 29, 1984.

[2] In addition to the commodities listed, substantial quantities of stone and sand and gravel are produced by local authorities and road contractors. Ireland also produces significant quantities of manufactured diamond, but output is not quantitatively reported, and available general information is inadequate to make reliable estimates of output levels.

[3] Excludes output by local authorities.

[4] Figures given as reported in source; includes granite, marble, silica rock, sand, calcspar, fire clay, and slate and clays for cement production.

[5] Includes production by farmers and by Bord Na Mona.

[6] Includes milled peat used for briquet production.

[7] Produced from milled peat.

TRADE

The country continued to depend on imports of minerals and mineral products such as metals, industrial minerals, fertilizer materials, and mineral fuels. Lead and zinc concentrates and barites were exported to Western Europe. Exports to the United States included barite and magnesia; imports from the United States included silver, phosphates, and some anthracite.

Table 2.—Ireland: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	1,925	2,309	7	United Kingdom 620; France 531.
Metal including alloys:				
Scrap	2,365	3,479	--	United Kingdom 2,529; Netherlands 674.
Unwrought	2,173	1,876	--	United Kingdom 1,543; Japan 145.
Semimanufactures	2,140	1,783	5	United Kingdom 942; West Germany 361.
Copper:				
Ore and concentrate	17,525	7,430	--	Sweden 4,980; Finland 2,450.
Metal including alloys:				
Scrap	7,119	8,260	--	Belgium-Luxembourg 2,519; United Kingdom 1,893.
Unwrought	759	481	--	Belgium-Luxembourg 343; United Kingdom 79.
Semimanufactures	2,122	1,567	406	United Kingdom 785; U.S.S.R. 201.
Iron and steel:				
Iron ore and concentrate: Pyrite, roasted	17,296	1,933	--	All to United Kingdom.
Metal:				
Scrap	73,307	58,753	--	Spain 38,198; United Kingdom 18,848.
Pig iron, cast iron, related materials	114	1,790	--	Spain 1,678.
Ferroalloys:				
Ferromanganese	50	17	--	All to United Kingdom.
Unspecified	11	50	--	Mainly to United Kingdom.
Steel, primary forms	791	1,094	(2)	United Kingdom 934.
Semimanufactures	35,014	54,957	164	United Kingdom 35,595; West Germany 6,688.
Lead:				
Ore and concentrate	63,779	49,383	--	West Germany 12,707; Spain 8,932.
Metal including alloys:				
Scrap	2,226	3,858	--	Belgium-Luxembourg 2,518; Netherlands 821.
Unwrought	3,612	1,715	1	United Kingdom 1,422; Netherlands 212.
Semimanufactures	2,554	4,258	--	United Kingdom 3,472; Netherlands 709.
Magnesium: Metal including alloys, all forms	30	2	1	United Kingdom 1.
Manganese: Oxides	9,954	9,164	181	United Kingdom 2,052; Belgium-Luxembourg 1,508.
Nickel:				
Matte and speiss	--	47	--	Netherlands 36; Brazil 11.
Metal including alloys:				
Scrap	85	47	--	West Germany 28; United Kingdom 17.
Unwrought	75	19	--	All to West Germany.
Semimanufactures	195	206	--	West Germany 71; Switzerland 52.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	19,066	44,625	--	United Kingdom 37,231.
Silver:				
Waste and sweepings[3] value, thousands	$978	$887	--	United Kingdom $553; West Germany $296.
Metal including alloys, unwrought and partly wrought troy ounces	160,369	180,944	NA	United Kingdom 111,274; France 32,504.
Tin: Metal including alloys:				
Scrap	163	192	--	United Kingdom 190.
Unwrought	2	119	--	Netherlands 118.
Semimanufactures	23	31	--	Belgium-Luxembourg 19.
Titanium: Oxides	64	25	--	Italy 18; United Kingdom 7.
Tungsten: Metal including alloys, all forms	4	6	(2)	United Kingdom 5.
Zinc:				
Ore and concentrate	254,132	343,770	--	Belgium-Luxembourg 113,037; Spain 51,126.
Oxides	58	31	1	United Kingdom 30.
Metal including alloys:				
Scrap	114	332	19	West Germany 142; United Kingdom 41.
Unwrought	451	230	--	All to United Kingdom.
Semimanufactures	114	29	(2)	United Kingdom 28.

See footnotes at end of table.

Table 2.—Ireland: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	6	38	--	All to United Kingdom.
Dust and powder of precious and semiprecious stones including diamond value, thousands	--	$208	$34	China $174.
Grinding and polishing wheels and stones	35	33	15	United Kingdom 9.
Asbestos, crude	20	109	--	United Kingdom 91.
Barite and witherite	260,691	267,501	88,100	United Kingdom 48,443; Nigeria 28,001.
Cement	130,826	168,872	1	United Kingdom 168,870.
Clays, crude	834	9	1	United Kingdom 7.
Diamond: Industrial carats	5,000	10,000	NA	NA.
Fertilizer materials:				
Crude, n.e.s	2,828	4,745	--	All to United Kingdom.
Manufactured:				
Ammonia	34,423	118,372	--	Spain 71,563; United Kingdom 23,463.
Nitrogenous	149,017	217,580	28,616	Belgium-Luxembourg 56,869; United Kingdom 54,936.
Phosphatic	5	20	--	All to United Kingdom.
Potassic	3,108	2	--	All to Netherlands.
Unspecified and mixed	82,161	51,534	--	United Kingdom 51,510.
Graphite, natural	61	5	5	
Gypsum and plaster	39,992	54,244	--	All to United Kingdom.
Lime	193	3,063	--	Do.
Magnesium compounds	77,361	71,531	26,546	Belgium-Luxembourg 17,495; Austria 10,970.
Phosphates, crude	486	42	--	All to United Kingdom.
Pigments, mineral: Iron oxides and hydroxides, processed	--	6	--	All to West Germany.
Precious and semiprecious stones other than diamond: Natural value, thousands	$122	$218	--	United Kingdom $157; Switzerland $46.
Salt and brine	182	800	--	United Kingdom 785.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	47	39	--	All to United Kingdom.
Sulfate, manufactured	49	37	NA	NA.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	3,428	2,000	309	United Kingdom 1,663.
Worked	1,106	2,451	1,293	United Kingdom 1,119.
Gravel and crushed rock	221,485	314,873	--	United Kingdom 239,183; West Germany 59,280.
Limestone other than dimension	1,203	573	([2])	United Kingdom 570.
Quartz and quartzite	374	324	--	United Kingdom 235; Netherlands 70.
Sand other than metal-bearing	5,235	7,436	([2])	United Kingdom 7,388.
Sulfur:				
Elemental: Crude including native and byproduct	105	36	--	All to United Kingdom.
Sulfuric acid	8,176	2,067	--	United Kingdom 1,282; Netherlands 785.
Talc, steatite, soapstone, pyrophyllite	64	248	--	United Kingdom 218; Netherlands 29.
Other:				
Crude	119	152	30	United Kingdom 122.
Slag and dross, not metal-bearing	16	67	--	Canada 47; United Kingdom 20.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	239	77	NA	NA.
Carbon: Carbon black	805	116	7	United Kingdom 59.
Coal: Anthracite and bituminous	9,235	3,430	--	United Kingdom 3,414.
Coke and semicoke	2,247	21	--	All to United Kingdom.
Gas, manufactured	75	91	--	United Kingdom 86.
Gas, natural thousand cubic feet	4,910	211	--	All to United Kingdom.
Peat including briquets and litter	131,682	157,342	--	United Kingdom 139,789; Egypt 8,122.
Petroleum refinery products thousand 42-gallon barrels	1,058	1,080	NA	United Kingdom 598; France 315.

NA Not available.

[1] Table prepared by Clarence Young and Jozef Plachy.

[2] Less than 1/2 unit.

[3] May include other precious metals.

Table 3.—Ireland: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	24	111,673	--	Guinea 111,650.
Oxides and hydroxides	4,289	4,042	326	United Kingdom 3,516.
Metal including alloys:				
Scrap	407	202	--	United Kingdom 199.
Unwrought	2,522	2,757	--	United Kingdom 1,740; France 499.
Semimanufactures	18,957	21,230	1,393	United Kingdom 10,405; West Germany 3,551.
Chromium: Oxides and hydroxides	89	147	1	Netherlands 65; United Kingdom 62.
Copper: Metal including alloys:				
Scrap	280	530	19	United Kingdom 492.
Unwrought	215	330	--	United Kingdom 218; West Germany 108.
Semimanufactures	17,561	17,855	233	United Kingdom 10,293; Belgium-Luxembourg 2,642.
Gold: Metal including alloys, unwrought and partly wrought value, thousands	$6,771	$4,190	NA	NA.
Iron and steel: Metal:				
Scrap	3,846	2,424	1	United Kingdom 2,361.
Pig iron, cast iron, related materials	1,906	1,594	NA	United Kingdom 713.
Ferroalloys:				
Ferromanganese	674	558	--	France 400; West Germany 137.
Ferrosilicon	297	146	NA	NA.
Silicon metal	67	123	NA	NA.
Steel, primary forms	13,510	9,924	25	United Kingdom 6,246; West Germany 1,654.
Semimanufactures	442,937	420,593	418	United Kingdom 203,570; West Germany 28,910.
Lead:				
Oxides	2,497	2,272	--	United Kingdom 2,182.
Metal including alloys:				
Scrap	7,455	7,689	--	United Kingdom 6,636; Netherlands 959.
Unwrought	1,389	1,478	--	United Kingdom 1,263; Canada 144.
Semimanufactures	1,481	1,326	43	United Kingdom 1,164.
Magnesium: Metal including alloys:				
Unwrought	53	147	(2)	Norway 126; United Kingdom 21.
Semimanufactures	133	93	--	United Kingdom 89.
Manganese:				
Ore and concentrate, metallurgical-grade	16,103	10,815	--	Ghana 10,452; Brazil 295.
Oxides	492	301	(2)	United Kingdom 218.
Mercury 76-pound flasks	^{r}78	447	--	Sweden 298; United Kingdom 145.
Nickel:				
Matte and speiss	14	5	--	All from United Kingdom.
Metal including alloys:				
Scrap	20	23	--	Do.
Unwrought	188	187	10	U.S.S.R. 84; Switzerland 80.
Semimanufactures	256	256	18	United Kingdom 90; West Germany 89.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	17,747	11,799	NA	United Kingdom 7,813.
Silver:				
Waste and sweepings[3] value, thousands	$47	$213	--	All from United Kingdom.
Metal including alloys, unwrought and partly wrought troy ounces	602,413	282,219	NA	United Kingdom 211,005.
Tin: Metal including alloys:				
Scrap	1	8	--	All from United Kingdom.
Unwrought	21	9	--	United Kingdom 8.
Semimanufactures	119	137	7	United Kingdom 114.
Titanium: Oxides	3,655	3,017	(2)	United Kingdom 1,215; Norway 695.
Tungsten: Metal including alloys, all forms	4	26	8	Austria 10; United Kingdom 8.
Zinc:				
Oxides	1,000	1,045	1	United Kingdom 879; West Germany 63.
Blue powder	211	135	NA	NA.
Metal including alloys:				
Scrap	365	251	--	All from United Kingdom.
Unwrought	2,098	1,814	--	Canada 543; Belgium-Luxembourg 439.
Semimanufactures	^{r}969	527	3	United Kingdom 436.

See footnotes at end of table.

Table 3.—Ireland: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Other:				
Ores and concentrates	^{r}5,663	92	19	Australia 53; United Kingdom 19.
Ashes and residues	2,160	2,484	NA	NA.
Base metals including alloys, all forms	191	150	117	United Kingdom 22.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	416	165	(2)	United Kingdom 149.
Artificial: Corundum	34	48	--	United Kingdom 37; West Germany 11.
Dust and powder of precious and semiprecious stones including diamond kilograms	93	286	286	
Grinding and polishing wheels and stones	616	499	27	West Germany 147; Austria 123.
Asbestos, crude	6,173	5,777	(2)	Cyprus 2,813; Republic of South Africa 1,681.
Barite and witherite	319	300	(2)	United Kingdom 232.
Boron materials:				
Crude natural borates	958	1,225	705	Netherlands 441.
Oxides and acids	200	111	--	France 106.
Cement	52,811	100,702	1	Spain 35,973; West Germany 26,516.
Chalk	3,526	1,907	--	United Kingdom 1,754.
Clays, crude	32,694	27,924	335	United Kingdom 16,028; Spain 9,670.
Diamond:				
Gem, not set or strung value, thousands	$110	$245	--	United Kingdom $141; Belgium-Luxembourg $97.
Industrial thousand carats	25	3,380	3,360	United Kingdom 20.
Diatomite and other infusorial earth	472	469	314	United Kingdom 114.
Feldspar, fluorspar, related materials	5,856	7,586	--	Norway 6,613.
Fertilizer materials:				
Crude, n.e.s	2,863	3,864	--	United Kingdom 3,836.
Manufactured:				
Ammonia	20,212	1,365	--	Netherlands 788; United Kingdom 479.
Nitrogenous	133,812	201,178	10	Belgium-Luxembourg 59,532; Sweden 44,842.
Phosphatic	142,260	98,418	14,157	Netherlands 25,624; Tunisia 14,641.
Potassic	319,786	258,020	(2)	West Germany 119,590; France 49,322.
Unspecified and mixed	341,074	353,612	45,778	United Kingdom 125,826; Netherlands 41,587.
Graphite, natural	64	22	6	United Kingdom 13.
Gypsum and plaster	14,163	5,474	181	United Kingdom 2,632; West Germany 942.
Lime	1,811	626	--	United Kingdom 562.
Magnesium compounds	19,816	37,410	NA	Greece 14,254; Netherlands 7,250.
Mica:				
Crude including splittings and waste	313	375	21	United Kingdom 344.
Worked including agglomerated splittings	172	43	40	United Kingdom 2.
Phosphates, crude	36,858	9,669	--	Morocco 9,216.
Pigments, mineral: Iron oxides and hydroxides, processed	2,216	1,921	6	West Germany 1,561; United Kingdom 229.
Potassium salts, crude	37	38	--	All from United Kingdom.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$135	$91	$1	United Kingdom $36.
Synthetic do	$86	$6	--	Switzerland $3.
Salt and brine	^{r}74,849	88,964	4	United Kingdom 53,758; West Germany 19,096.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	7,473	15,220	--	United Kingdom 11,818; Poland 1,758.
Sulfate, manufactured	907	694	NA	NA.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	6,253	6,825	--	Republic of South Africa 2,994; India 1,144.
Worked	4,023	3,788	2	Italy 2,275; United Kingdom 906.
Dolomite, chiefly refractory-grade	1,386	809	--	United Kingdom 501; Netherlands 272.
Gravel and crushed rock	351,166	336,979	12	United Kingdom 336,059.
Limestone other than dimension	3,563	5,364	--	All from United Kingdom.
Quartz and quartzite	387	879	1	Italy 383; Portugal 360.
Sand other than metal-bearing	147,468	126,963	27	United Kingdom 87,099; Belgium-Luxembourg 34,250.

See footnotes at end of table.

Table 3.—Ireland: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Sulfur:				
Elemental:				
Crude including native and byproduct	473	443	--	United Kingdom 302; West Germany 113.
Colloidal, precipitated, sublimed	89	178	--	United Kingdom 177.
Sulfuric acid	41,428	45,828	18	United Kingdom 26,699; Netherlands 9,723.
Talc, steatite, soapstone, pyrophyllite	2,492	2,538	2	China 1,120; United Kingdom 740.
Other:				
Crude	6,933	5,655	31	Italy 2,800; Republic of South Africa 1,239.
Slag and dross, not metal-bearing	5,436	2,584	19	Netherlands 1,289; Belgium-Luxembourg 960.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	3,538	1,693	80	United Kingdom 1,040; Trinidad and Tobago 270.
Carbon: Carbon black	16,777	9,866	33	United Kingdom 3,435; Netherlands 2,789.
Coal:				
Anthracite thousand tons	37	41	--	United Kingdom 10; Netherlands 7.
Bituminous do	1,252	1,196	280	Poland 435; United Kingdom 435.
Lignite including briquets do	12	15	--	West Germany 14.
Coke and semicoke do	7	9	(2)	West Germany 6; United Kingdom 2.
Gas, manufactured	81	10	NA	NA.
Peat including briquets and litter	391	626	--	United Kingdom 590.
Petroleum:				
Crude thousand 42-gallon barrels	4,787	3,625	(2)	Saudi Arabia 2,040; United Kingdom 1,585.
Refinery products do	33,336	31,881	421	United Kingdom 26,360; Netherlands 1,475.

[r] Revised. NA Not available.

[1] Table prepared by Clarence Young and Jozef Plachy.

[2] Less than 1/2 unit.

[3] May include other precious metals.

COMMODITY REVIEW

METALS

Aluminum.—Construction of the Aughinish, County Limerick, alumina plant was completed and production started, although startup troubles still had to be overcome. The plant was designed originally for a capacity of 800,000 tons of alumina per year but with option to be expanded to 2.4 million tons per year. The Bechtel Corp. of the United States was the designer and constructor, at a cost of $800 million. The plant was operated by Aughinish Alumina Ltd., owned by Alcan Aluminium Ltd. (40%), Billiton Aluminium Ireland Ltd. (35%), and Arco Metals Ltd. (25%). New Guinea bauxite was processed into feedstock for smelters in the United States and Europe.

Lead and Zinc.—Financially, the year was a good one for the Tara Exploration and Development Co. Ltd. The company, a subsidiary of the Canadian company, Northgate Exploration Ltd., had a net income of $7.4 million compared with $3.9 million in 1982 and a loss of $10 million in 1981.

Northgate transferred most of its Irish assets to Ennex International, a new company. However, the group retained its 10% interest in Tara Exploration. Noranda Ltd. remained the major shareholder with 49% while Charter Consolidated PLC had a further 14% stake. Zinc prices of $0.38 per pound helped little financially, but stronger dollar exchange rates more than offset increased treatment charges. Further improvements were expected in drawing down outstanding debts, as $17 million was repaid to banks and the Irish Export Development Corp. Operating income at the company's Navan Mine, Ireland's last and only metal ore mine, 75% owned and operated by a subsidiary, Tara Mines Ltd., and 25% by the Irish Government, soared to $10.7 million from a loss of $0.8 million previously. Output of zinc in concentrates reached its highest level since 1980, as the mine reached and sustained its rated capacity, and 186,000 tons of zinc in concentrate and 33,600 tons of lead in concentrate were recovered.

Bula Ltd., owner of the adjacent portion of the Navan ore body, continued efforts to bring its property into production. It was understood that a number of international companies were contacted for possible involvement in the project, and the Irish Government was also considering additional investment.

NONMETALS

Barite.—Magcobar (Ireland) Ltd. remained the main producer of barite, delivering 191,000 tons from its Ballynoe, County Tipperary, opencast operation. At Dundeen Bay, Clonakilty, County Cork, Nym Ltd., a company owned by several Irish and non-Irish interests, reopened a smaller mine closed in 1982 by Milchem Minerals Ltd. Plans called for extracting 20,000 tons per year of barite from the underground mine.

Cement.—The construction industry remained depressed. Cement Ltd. completed conversion of its Limerick plant from oil to coal. The plant, with a capacity of 2.1 million tons per year, produced only 1.38 million tons, or 7% below the 1982 output.

Gypsum.—As in the cement industry, production was restrained by reduced building activity. Irish Gypsum Ltd. produced only 352,000 tons.

Magnesia.—Premier Periclase Ltd., a wholly owned subsidiary of Cement Roadstone Holdings Ltd., resumed the production of magnesia from seawater at Drogheda, northeast Ireland. There was a loss of $0.7 million on export sales of $17 million. Problems were caused by the steel industry slump, a major user of the product, and by the high cost of oil used in the process.

MINERAL FUELS

Of the total domestic energy supply, natural gas production accounted for 16%; peat and coal, 16%; and hydroelectric power, 2%. Oil and coal imports accounted for 66%.

Coal.—Low-quality semibituminous coal was mined on a small scale from the Connaught Coalfield and was used mainly to supply the small local power station. Limited quantities of anthracite were mined in Slieve Ardagh and Leinster Coalfields in the south. Work on development of the Electricity Supply Board Moneypoint coal-fired generating station continued. Commissioning of the project, designed to rate 900 megawatts in its first phase, was expected in 1986.

Natural Gas.—The Governments of Ireland and the United Kingdom have concluded an agreement for extending the Kinsale-Dublin natural gas pipeline to northern Ireland and Belfast, with possible supply to the area along the pipeline; for example, to Drogheda.

Petroleum.—Offshore, there was a revival of drilling activity with seven wells spudded, all in the Celtic Basin off the south coast of Ireland. The most rewarding find was in well 4919-2 operated by Gulf Oil (Ireland) Ltd., which flowed at a cumulative rate of nearly 10,000 barrels per day, along with more than 2 million cubic feet of natural gas per day. The well was located 40 kilometers from the coast in only 70 meters of water, and an appraisal well was spudded in block 4919-3. It was expected that the find would further enhance the pace of activities in this area in 1984. A third round of exclusive licensing was announced for 76 blocks in the Celtic and Irish Seas; the closing date was February 15, 1985, for these applications. The current license area of the northwest Carboniferous Basin was the object of onshore exploration, and there were plans for drilling at least two wells there in 1984. The operator was Aran Energy Co.

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[1] Foreign mineral specialist, Division of Foreign Data.

[2] Where necessary, values have been converted from Irish pounds (£) to U.S. dollars at the rate of £1=US$1.25, the average for 1983.

The Mineral Industry of Israel

By Ben A. Kornhauser[1]

The Israel Central Bureau of Statistics reported a 4% increase in industrial production in 1983 over that of 1982. However, the industrial-mining component of industrial production was a relatively small portion of the total. Continued emphasis by the Government on increased industrial production for export and attempts to find commercial mining projects were expected to raise the sector's importance to the economy. Key developments in the industry during the year included the merging of the Hamegader Co.'s new minirolling mill, which could not survive without state support, into the Israeli Steel Mills Ltd. providing an annual joint production capacity of 300,000 tons of round and reinforcing bars. The Dead Sea Works (DSW), a subsidiary of the Government-owned Israel Chemicals Ltd. (ICL), shipped over 100,000 tons of potash to the Pascagoula, Mississippi, warehouse of the Mississippi Chemical Corp. (MCC) on a 10-year contract to supply from 100,000 to 300,000 tons per year. In addition to expanding its potash capacity by 1985, ICL was considering adding rail or conveyor systems to haul potash ore to shipping terminals.

The search for oil and alternative energy sources continued in order to reduce Israel's fuel costs and to better its balance of payments. Oil exploration was to be continued at depths greater than 20,000 feet, particularly in the area between the Coastal Plain, the Northwest Negev Desert, and the Dead Sea Province. A pilot plant was dedicated to the direct combustion of crushed oil shale with work continuing on extracting synthetic fuel from oil shale. Biogas and waste material systems were being developed as commercial energy sources.

PRODUCTION AND TRADE

The industrial production index, as reported by the Israel Central Bureau of Statistics, increased by approximately 4% in 1983 over that of 1982. The weights of the industrial-mining components in the index were 3.2% for mining and quarrying, 2.6% for basic metal, 3.8% for nonmetallic mineral products, and 9.8% for chemical and oil products. This component only totaled 19.4% of the index, a relatively small number. Of the mineral production reported by the Bureau, potash production decreased from that of 1982 while the production of natural gas, petroleum, and cement declined 9%, 8%, and 6%, respectively, from that of 1982. Exports in 1983 of diamonds, ore, and chemicals amounted to $1,158 million, $217 million, and $644 million, or 4%, 15%, and 1%, respectively, greater than their values in 1982.[2] Imports of diamonds and fuel were $853 million and $1,607 million or plus 33% and minus 16%, respectively, from those of 1982. Israel had been importing 40% of its oil needs from Mexico, 25% from Egypt, and the balance from the spot market. However, contracts had been signed in September to purchase 3.5 million barrels of oil from the Norwegian National Co., Statoil, over the next year.

By the end of fiscal year 1983, inflation was at an annual rate of 191%. In 1983, Israel's balance-of-payments deficit rose $400 million to a record-high $5.1 billion, nearly 25% of the value of the gross national product, and its foreign debt reached $21.5 billion. The rise of about $1.5 billion in foreign debt resulted mainly from public service debt for financing loans to cover the country's trade deficit.[3] Exports had fallen precipitously while imports and private and public consumption were rising steadily. The growing deficit in the balance of payments was considered mainly due to the slow rate of Israel's devaluation and the continued strength of the dollar on which its accounts were based. The net result was a drop in the value and profitability of exports and an increased cost of imports. Cutbacks in social services and defense spending were needed to reduce inflation and revive the economy, but political factors prevented such actions.

Table 1.—Israel: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
METALS					
Copper, oxide (80%-90% Cu):[e]					
Gross weight	--	[2]800	NA	4,200	4,200
Metal content	--	600	NA	3,500	3,500
Iron and steel: Steel, crude[e]	107,000	115,000	120,000	120,000	150,000
NONMETALS					
Barite (60% $BaSO_4$)	500	750	NA	NA	NA
Bromine:					
Elemental	45,813	44,059	44,019	70,000	61,000
Compounds	32,387	31,792	32,248	50,500	47,500
Cement, hydraulic (from domestic clinker) thousand tons	1,720	1,842	2,361	2,189	2,058
Clays:					
Bentonite	6,287	18,321	12,581	12,000	61,838
Flint clay	17,690	14,351	9,133	25,000	9,108
Kaolin	22,317	9,495	37,299	12,000	26,844
Other	19,686	32,073	2,926	35,000	18,274
Gypsum	72,500	[e]80,000	42,700	42,000	43,000
Lime	[e]124,000	[e]124,000	80,000	50,000	50,000
Nitrogen: N content of ammonia	68,500	54,800	42,700	49,300	45,754
Phosphate rock, beneficiated thousand tons	2,086	2,307	2,372	2,171	2,968
Potash, K_2O equivalent do.	737	797	839	1,004	1,000
Salt, marketed (mainly marine)	107,352	18,010	132,250	148,200	145,000
Sand:					
Glass sand	71,033	71,465	62,700	65,000	60,966
Other (for building industry) thousand tons	3,787	3,900	4,100	4,000	4,300
Sodium and potassium compounds: Caustic soda	25,919	35,268	34,553	29,346	30,974
Stone:					
Crushed thousand cubic meters	12,103	4,696	5,000	6,000	6,000
Dimension, marble	31,000	14,000	14,000	15,000	15,000
Sulfur:					
Byproduct from petroleum[e]	10,000	10,000	10,000	10	10
Sulfuric acid thousand tons	226	[r]209	182	154	171
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural, marketed million cubic feet	3,531	7,769	13,420	2,580	2,340
Peat[e] thousand tons	18	20	20	20	20
Petroleum:					
Crude:					
From Israel proper thousand 42-gallon barrels	150	142	116	91	84
From occupied Sinai Peninsula[e] do.	10,800	12,500	NA	--	--
Refinery products:					
Gasoline do.	8,395	8,640	NA	NA	NA
Kerosine and jet fuel do.	6,205	6,120	NA	NA	NA
Distillate fuel oil do.	11,315	11,160	NA	NA	NA
Residual fuel oil do.	30,000	19,080	NA	NA	NA
Lubricants do.	NA	360	NA	NA	NA
Other do.	2,800	5,760	NA	NA	NA
Refinery fuel and losses do.	2,200	3,960	NA	NA	NA
Total do.	60,915	55,080	NA	NA	NA

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available from the Mar. 1984 monthly Bulletin of Statistics, Israel Central Bureau of Statistics, v. 35, Jerusalem; and the Israel Geological Survey.

[2] Production of copper cement reported in 1980 contained 70% to 80% Cu metal.

COMMODITY REVIEW

METALS

Iron and Steel.—Israeli Steel Mills, with a ministeelworks at Akko, took over the new rolling mill owned by Hamegader, a private company, in Kiriat Gan. In 1980, the Government permitted Hamegader to build a second Israeli rolling mill without state financial support, provided its bars would replace imports. Hamegader's financial problems led to the merger prior to commissioning of the new mill. The two mills would have a joint production of about 300,000 tons per year of round bar and rebar. The Akko mill produced an estimated 150,000 tons of 8- to 28-millimeter-diameter bar in 1983, while the Kiriat Gan mill, when completed in 1984, was expected to produce 150,000 tons of bar down to 5.55 millimeters diameter. The continuous bar mill at Kiriat Gan was supplied by Simac, an Italian company, and had a rated capacity of 50 tons per hour of straight and cut bar lengths. The steel for the mill was melted in two 60-ton electric arc furnaces.

Magnesium.—The Castle Lead Works (Pty.) Ltd., at Isithebe, Republic of South Africa, acquired an Israeli-developed process for recovering secondary magnesium metal from scrap magnesium-aluminum alloys. The recovery plant was to be operational by January 1, 1984, and was expected to provide most of the Republic of South Africa's magnesium requirements reducing the need to import primary magnesium.

NONMETALS

Fertilizer Materials.—*Phosphorus.*—The Negev Phosphates Ltd. lost an estimated $2.9 million in the first 6 months of fiscal year 1983, caused mainly by the drop in the world fertilizer market and its prices. To curb these losses, the company accelerated the installation of a partial oxygenation facility in Rotham Plain to enable closing the current plant producing white phosphoric acid, reduced the production of fluorescent phosphate to between 18,000 to 20,000 tons, and spread out the planned investment capital over a longer time. A $30 million investment had been planned to increase the plant's annual capacity of phosphoric acid by 120,000 tons up to 180,000 tons.[4]

Potash.—Owing to the world recession and the resulting depressed fertilizer prices, DSW sold more potash in fiscal year 1983 but earned 10% less money. DSW produced 8.3% and shipped 14% more than in fiscal year 1982.[5] In July 1983, DSW shipped over 100,000 tons of potash to Pascagoula, Mississippi, to the warehouse facility of MCC. In April, DSW and MCC signed a 10-year renewable contract for 100,000 to 300,000 tons per year of potash at a price related to the Carlsbad, New Mexico, potash prices. The key factors in MCC's decision were based on the cost of production and transportation to the gulf coast from Carlsbad relative to DSW's delivered price. Reportedly, shipping costs per ton of potash were $10 to $12 from Israel compared with $28 to $35 from Carlsbad. This contract was expected gradually to increase present annual potash sales to the United States from 350,000 to 400,000 tons and from $50 to $100 million per year.

DSW was expanding its potash capacity by 900,000 tons to 2.1 million tons per year by 1985 at an estimated cost of $90 million. Currently, trucks hauled potash from the Dead Sea, 1,300 feet below sea level, to the rail terminus at Tsefah, about 25 miles away, but the rugged terrain hampered increased shipments. The Government and DSW were weighing two systems for faster and more efficient transport. One system would be a covered conveyor carrying about 600 tons per hour to the Tsefah railway station, then by railway cars on the proposed rail route to Eilat and the Ashdod Port. The conveyor would be capable of carrying coal to the Sdom powerplant, once it converted to coal. The other system would extend a railway line to the Dead Sea. Canadian Pacific Ltd. had proposed funding such an extension, estimated to cost $44 million, and would accept payment in the form of phosphate and tourist service. It was believed that the railway line would be instrumental in developing the Negev Desert.[6]

MINERAL FUELS

Petroleum.—The Government approved a $50 million oil exploration program by Seismica Israel Ltd. over a 5-year period. The program included extensive seismic surveys and several drill holes with at least one at Sdom; three planned to a depth of more than 20,000 feet at an investment of about $18 million. The area in which Seismica proposed to work as part of concessions is mostly in the Dead Sea region and was previously held by the Israel National Oil Co., largely Government-owned. License terms included a 27.5% depletion allowance and 12.5% royalties. Each exploration license, at minimal fees, covered 100,000 acres for 3 years with an option to extend for 4 years. If oil were discovered, the license could be converted to a 30-year lease that could be extended 20 years. One firm could hold as many as 12 licenses with possible waiver of this restriction.

Exploration in Israel was centered in the Coastal Plain region, the area between the Coastal Plain, the Northwest Negev, and the Dead Sea Province. At present, several small U.S. and Canadian oil companies were running seismic surveys and had drilled, or planned to drill, wells in various parts of the country.[7] About $65 million was spent in oil exploration in Israel in 1983 compared with about $35 million in 1982. Oil found to date came from thin, inconsistent, lower Cretaceous sands. New, higher cost holes were expected to be drilled lower down in the massive Jurassic formations.[8]

Oil Shale.—In 1983, the 75% Government-owned Energy Resources Development Ltd. (PAMA) dedicated a pilot plant for the direct combustion of oil shale to produce steam for the generation of electricity. PAMA crushed and burned the oil shale extracted from extensive deposits discovered near Arad. A second pilot plant was expected to be completed within 5 years to extract synthetic fuel. The two plants were estimated to cost $60 million. Based on preliminary technical and economic studies, the cost per barrel of low sulfur fuel was placed at $35. The Paraho Overseas Corp. of Grand Junction, Colorado, was a leading candidate for the contract to build the pilot plant. The oil shale deposits were estimated at 5 billion tons of easily mined deposits, containing about 42 gallons of crude oil per ton. Israel's annual oil consumption was approximately 57 million barrels, of which imports were 40% from Mexico, 25% from Egypt, and the balance from the spot market.

Other Energy.—More than a dozen full-scale biogas installations, developed by the Kibbuty Industries Association, were being set up for the economic and most advantageous utilization of organic wastes. The industrial-scale anaerobic digesters would produce a combustible gas, composed of 60% methane and 40% carbon dioxide, a high-quality feed, fertilizer, and a plant substrate rich in nutrients. The system was being adapted to all types of wastes from agriculture such as cattle manure, straw, corn cobs, and cotton stalks; from waste materials from slaughter houses and canneries; and from municipal garbage and sewage.

An industrial-process steam plant at Kfar Masaryk was being compiled; it was a new fluidized-bed steam generator that was fueled by cotton seed hulls. The plant's rated capacity of 27 tons of steam per hour could be increased by 20%. The new installation also could use different types of fuel, including biomass and fossil fuel. The total investment of about $3 million was expected to save importing approximately 75,000 barrels of petroleum per year at a cost of over $2 million.

The Israeli Research Center in the Negev Desert developed a resin-bed ion exchange process for extracting uranium from a wet phosphoric acid process that was said to be much cheaper than current solvent extraction methods. A semi-industrial scale plant was placed in operation adjacent to the phosphoric acid plant of Rotem Fertilizers Ltd., a subsidiary of ICL.[9]

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Israeli shekels (I) to U.S. dollars at the average rate of I24.26=US$1.00 for 1982 and I56.23=US$1.00 for 1983.

[3] Jerusalem Post. July 11, 1983, p. 8.

[4] Engineering and Mining Journal. V. 185, No. 1, Jan. 1984, p. 47.

[5] Jerusalem Post. July 28, 1983, p. 8.

[6] ———. Dec. 12, 1983, p. 5.

[7] Oil & Gas Journal. V. 82, No. 2, Jan. 9, 1984, pp. 44-45.

[8] Petroleum Economist. V. 50, No. 6, June 1983, pp. 217-219.

[9] Engineering and Mining Journal. V. 185, No. 2, Feb. 1984, p. 16.

The Mineral Industry of Italy

By Roman V. Sondermayer[1]

During 1983, Italy remained relatively deficient in most basic industrial raw materials and fuels. However, Italy was an important processor of imported fuels and crude minerals in Europe. The more prominent minerals, with production expressed in approximate percentages of world production, were pumice, 53% to 54%; feldspar, 22% to 23%; cement and bentonite, 4% to 5%; steel, fluorspar, asbestos, and magnesium, 3% to 4%; and aluminum, barite, alumina, cadmium, gypsum, pig iron, salt, sulfur, and zinc, 2% to 3% each. The economy of Italy slowed when compared with its performance in 1982. Preliminary indices on performance of the economy published by the Government showed an overall decline between 5% and 6%. The same indices related to the mineral industry, including the processing sector, showed a similar drop.

The standing Interministerial Committee for Economic Policy started to implement the tasks assigned to it by the mining law enacted in 1982. The committee decided to plan exploration to identify new mineral deposits and resources. This activity was to include presently worked deposits and extensions of those deposits. Commodities included in the plan, with priorities in funding, were bauxite, lead, zinc, copper, gold, manganese, fluorite, tungsten, barite, and coal. The wholly owned subsidiary of Ente Nazionale Idrocarburi (ENI), Rimini S.A., carried out geochemical exploration in southern Tuscany.

The extractive industry was insignificant for the overall economy of the country. However, in some areas of the country, certain uneconomic mines and associated plants were the only activity that provided employment. Consequently, the Government was covering their losses to avoid economic disasters in these areas.

The minerals and fuels processing branch was by far the most important part of the mineral industry. Of an estimated value for industrial production of $240 billion,[2] the value of the products of the mineral industry was about 16%. The labor force of Italy was estimated at 20.6 million persons, including about 7.4 million employed in industry. Reports indicated that extractive industry provided employment for 57,000 persons.

The principal events in the mineral industry included exploration for bauxite in Sardinia; completion of the first large copper refinery in Italy, near Venice; consolidation of steel producing installations; exploration for lead and zinc near existing mines; and preparation for closing a graphite mine in Piedmont.

PRODUCTION

During 1983, as in the past, the mining and processing sectors were owned by public and private enterprises, but the Government controlled most of the sector. ENI and Finsider were the principal Government organizations involved in the production and processing of minerals. Società Mineraria e Metallugica di Pertusola S.A. (Pertusola), Acciaierie Ferriere Lombarda Falck (Falck), and major foreign oil and gas companies were the most prominent privately owned companies of the sector.

In the mineral sector, production results varied when compared with those of 1982. The extractive sector had the worst performance among the various sectors of the mineral industry. Declines in the extractive sector ranged from 20% to 23%. In the processing sector, where decreases were lower or some increases in performance were recorded, the overall decline was limited to 5% or 6%. Production of the petroleum sector was the major factor in better performance of the processing sector.

Table 1.—Italy: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[p]
METALS					
Aluminum:					
Bauxite	26,095	23,260	19,000	23,010	23,000
Alumina	854,120	900,373	786,357	698,329	475,671
Metal:					
Primary	269,112	271,211	273,845	232,861	[2]195,694
Secondary	245,000	266,000	250,000	242,000	240,000
Antimony:					
Mine output, metal content	950	713	696	339	--
Metal, total	776	[r]732	792	1,047	1,000
Bismuth metal	19	[r]43	15	28	23
Cadmium metal, smelter	527	568	489	475	450
Copper:					
Mine output, metal content	489	604	748	138	1,538
Metal, refined, secondary	15,600	12,200	23,700	19,600	20,000
Iron and steel:					
Iron ore and concentrate:[3]					
Gross weight thousand tons	219	185	123	3	2
Iron content do.	88	73	50	1	1
Metal:					
Pig iron do.	11,327	12,149	12,260	11,537	10,341
Ferroalloys:					
Blast furnace:					
Spiegeleisen	3,019	4,990	832	957	950
Ferromanganese	67,384	[e]61,000	59,302	57,366	57,000
Electric furnace:					
Ferromanganese	21,886	[e]22,092	12,468	15,987	16,000
Silicomanganese	54,513	44,914	54,563	58,118	58,000
Ferrosilicon	80,521	71,857	55,144	63,947	63,000
Silicon metal[e]	15,000	15,000	15,000	15,000	15,000
Ferrochromium	42,531	41,150	10,333	36,541	36,000
Other	11,108	14,679	12,252	11,552	11,000
Total	295,962	275,682	219,894	259,468	256,950
Steel, crude thousand tons	24,250	26,501	24,777	23,981	24,000
Semimanufactures:					
Wire rod do.	1,758	1,933	1,935	NA	NA
Sections do.	8,331	8,782	7,812	NA	NA
Plates and sheets do.	5,457	5,895	6,453	NA	NA
Hoop and strip do.	872	871	781	NA	NA
Railway track material do.	221	217	216	NA	NA
Ingots, semimanufactures and solids for tubes do.	1,058	1,089	1,276	NA	NA
Other do.	851	859	1,276	NA	NA
Total do.	18,548	19,646	19,749	NA	NA
Castings and forgings do.	672	747	783	NA	NA
Cold-rolled sheet do.	2,851	2,690	2,646	NA	NA
Seamless tubes do.	824	880	1,094	NA	NA
Lead:					
Mine output, metal content	28,057	22,879	21,300	16,187	23,561
Metal:					
Refined:					
Primary	[r]25,218	42,057	35,556	36,360	36,955
Secondary	101,000	91,600	97,400	97,300	90,000
Magnesium metal, primary	8,757	[r]9,676	10,800	9,943	10,000
Manganese, mine output:					
Gross weight	9,782	9,165	8,756	8,727	7,205
Metal content	2,935	2,763	2,614	2,618	2,215
Mercury metal 76-pound flasks	--	96	7,527	4,612	--
Silver metal thousand troy ounces	1,065	1,366	1,768	1,791	2,361
Tin alloys	5,600	[e]5,500	NA	NA	NA
Zinc:					
Mine output, metal content	66,285	58,417	43,906	39,601	43,000
Metal, primary	202,272	206,430	180,903	158,560	155,893
NONMETALS					
Asbestos	143,931	157,794	137,086	116,410	139,054
Barite	214,630	203,038	177,005	180,022	139,090
Bromine[e]	590	590	600	600	500
Cement, hydraulic thousand tons	39,289	41,772	41,553	39,728	40,000

See footnotes at end of table.

Table 1.—Italy: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[p]
NONMETALS —Continued					
Clays, crude:					
Bentonite thousand tons	282	332	277	237	297
Refractory excluding kaolinitic earth do.	268	226	270	[e]250	220
Fuller's earth	1,080	4,300	5,495	[e]5,500	5,000
Kaolin thousand tons	67	89	74	53	50
Kaolinitic earth do.	25	27	31	30	25
Diatomite[e]	30,000	30,000	25,000	20,000	25,000
Feldspar	294,648	344,301	428,485	783,411	800,000
Fluorspar:					
Acid-grade	134,349	124,774	128,838	134,127	128,019
Metallurgical-grade	41,557	26,229	35,397	32,822	49,615
Ceramic-grade	6,885	962	--	--	--
Total	182,791	151,965	164,235	166,949	177,634
Graphite, all grades	4,102	3,957	3,535	3,210	3,200
Gypsum, except dimension stone use[e] thousand tons	4,200	4,200	4,820	1,600	1,700
Lime, hydrated and quicklime do.	[r]2,100	2,365	2,307	[e]2,300	2,200
Nitrogen: N content of ammonia do.	[r]1,430	[r]1,397	1,207	1,406	1,100
Perlite[e]	90,000	90,000	85,000	80,000	75,000
Pigments, mineral: Iron oxides, natural[e]	1,000	1,000	900	800	900
Potash, crude salts:					
Gross weight thousand tons	1,527	1,302	1,418	1,460	1,674
K_2O equivalent do.	182	156	142	146	140
Pumice and related materials:					
Pumice and pumiceous Lapilli[e] do.	850	571	600	750	700
Pozzolan[e] do.	5,900	5,156	6,000	5,500	5,000
Pyrites, all types, gross weight do.	804	859	681	667	646
Salt:					
Marine, crude[e] do.	1,200	1,300	964	1,000	1,100
Rock and brine do.	4,490	3,997	3,610	3,605	3,454
Sodium and potassium compounds:					
Caustic soda	9,858	9,531	8,484	[e]9,000	9,000
Sodium carbonate[e] thousand tons	95	95	95	90	85
Sodium sulfate[e] do.	[r]2,100	[r]100	[r]90	[r]85	90
Stone, marble in blocks, all kinds[4] do.	2,100	2,200	2,100	2,000	1,900
Strontium minerals: Celestite	1,693	1,053	6,697	3,272	3,300
Sulfur:					
Gross weight of ore thousand tons	108	101	96	88	80
Recovered as elemental and in compounds:					
Elemental from ore do.	19	23	20	10	--
S content of pyrites do.	302	331	261	269	271
Byproduct, oil refining do.	[e]37	30	25	10	10
Byproduct, other sources[e] do.	213	220	205	200	200
Total do.	571	604	511	489	481
Talc and related materials	157,382	165,905	163,390	163,970	158,974
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bituminous rock, natural	124,731	117 893	[r] [e]100,000	[e]105,000	100,000
Carbon black[e]	170,000	170,000	170,000	160,000	150,000
Coal:					
Lignite thousand tons	2,123	1,933	1,958	1,913	1,713
Coke, metallurgical do.	7,502	8,266	8,071	7,400	NA
Gas, natural: Marketed million cubic feet	475,553	442,543	495,944	512,377	458,930
Natural gas liquids thousand 42-gallon barrels	141	150	140	140	130
Petroleum:					
Crude do.	11,360	12,264	10,532	11,881	14,961
Refinery products:					
Liquefied petroleum gases do.	(5)	(5)	22,132	21,518	22,132
Gasoline, all kinds do.	141,976	124,550	129,116	132,693	125,732
Naphtha do.	(5)	(5)	28,490	24,738	24,269
Jet fuel do.	16,520	14,720	9,208	8,312	7,880
Kerosine do.	24,784	18,747	21,901	23,405	18,933
Distillate fuel oil do.	225,889	190,603	189,230	181,822	172,288
Residual fuel oil do.	333,300	244,935	249,017	212,793	190,322
Lubricants do.	6,440	7,196	6,356	(5)	(5)
Other do.	86,788	76,105	39,781	39,326	41,300
Refinery fuel and losses do.	49,696	42,231	45,806	48,151	46,167
Total do.	885,393	[r]719,087	741,037	692,758	649,023

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through Aug. 28, 1984.

[2] Reported figure.

[3] Excludes pelletized iron oxide derived from pyrites.

[4] In addition to marble, Italy produced a large variety of stone; production was not reported.

[5] Included with other refinery products.

TRADE

Italy had an overall negative trade balance of about $0.5 billion and was dependent on imports of significant quantities of raw materials and fuels to meet its industrial demand.

Imports were valued at $72,500 million, and exports at $72,000 million. Exports of minerals, including fuels, were valued at $7,800 million or close to 10% of the total value of exports. Iron and steel products were the most valued export items, about $3,300 million, followed by fuels at $3,200 million. Imports of minerals, fuels included, showed a value of $30,600 million or about 42% of the total value of imports. Fuels accounted for about 80% of imports of minerals and about 34% of Italy's total imports.

Mineral trade between the United States and Italy was insignificant. United States exports to Italy mostly comprised fuels, and imports largely included iron and steel products.

Table 2.—Italy: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	18,229	8,240	--	Greece 5,454; Netherlands 2,200.
Oxides and hydroxides	231,199	269,988	29	Netherlands 154,039; United Kingdom 51,243.
Metal including alloys:				
Scrap	3,167	3,380	--	West Germany 1,981; France 985.
Unwrought	49,802	54,115	6,435	West Germany 16,684; United Kingdom 4,984.
Semimanufactures	97,467	105,904	4,196	West Germany 23,720; France 22,561.
Antimony: Metal including alloys, all forms	37	4	NA	NA.
Bismuth: Metal including alloys, all forms	12	17	NA	NA.
Cadmium: Metal including alloys, all forms	259	79	NA	U.S.S.R. 60.
Cesium and rubidium: Metal including alloys, all forms	2	3	NA	NA.
Chromium:				
Ore and concentrate	3,046	436	--	France 134; Switzerland 105.
Metal including alloys, all forms	5	3	NA	NA.
Cobalt:				
Ore and concentrate	--	28	--	NA.
Oxides and hydroxides	25	29	--	France 22; West Germany 4.
Metal including alloys, all forms	27	63	NA	West Germany 5.
Columbium and tantalum: Metal including alloys, all forms:				
Columbium (niobium)	--	1	NA	NA.
Tantalum	9	54	NA	NA.
Copper:				
Ore and concentrate	2,356	657	--	West Germany 630.
Matte and speiss including cement copper	1,232	344	--	NA.
Metal including alloys:				
Scrap	24,533	19,042	(2)	West Germany 11,227; Belgium-Luxembourg 2,609.
Unwrought	7,977	8,564	73	West Germany 2,283; Iran 1,590.
Semimanufactures	101,228	96,365	1,020	France 26,501; West Germany 15,315.
Gallium: Metal including alloys, all forms	--	5	4	Belgium-Luxembourg 1.
Germanium: Metal including alloys, all forms	7	1	NA	Mainly to United Kingdom.
Gold: Metal including alloys, unwrought and partly wrought ___ troy ounces	73,658	49,995	9,613	United Kingdom 8,424; France 4,758.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	22	160	--	Austria 100; Belgium-Luxembourg 25.
Pyrite, roasted	46,934	39,218	--	France 20,503; Austria 8,357.
Metal:				
Scrap	22,636	17,149	--	France 7,824; West Germany 4,831.
Pig iron, cast iron, related materials	6,645	9,556	226	France 1,863; Netherlands 1,350.

See footnotes at end of table.

Table 2.—Italy: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Ferroalloys:				
Ferrochromium	8,805	9,109	383	West Germany 4,211; France 2,372.
Ferromanganese	672	2,805	--	West Germany 1,300; Egypt 1,200.
Ferromolybdenum	430	221	NA	Netherlands 188; Switzerland 17.
Ferronickel	50	119	NA	NA.
Ferrosilicomanganese	8,380	3,027	35	West Germany 2,765; Switzerland 163.
Ferrosilicon	6,626	4,361	192	France 1,808; India 1,000.
Silicon metal	8,044	6,124	56	West Germany 3,123; Hungary 450.
Unspecified	4,378	4,763	16	Romania 660; Mexico 633; France 402.
Steel, primary forms	963,294	906,088	40,040	West Germany 159,225; France 104,701.
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	2,953	2,173	17	West Germany 703; France 595.
Universals, plates, sheets do	1,625	1,574	121	France 372; U.S.S.R. 314.
Hoop and strip do	107	102	3	France 28; U.S.S.R. 10.
Rails and accessories do	18	12	(2)	Egypt 4; Switzerland 3.
Wire do	95	104	3	France 34; West Germany 17.
Tubes, pipes, fittings do	2,465	2,072	308	U.S.S.R. 706; France 178.
Castings and forgings, rough do	47	51	1	Yugoslavia 12; West Germany 9.
Lead:				
Ore and concentrate	17,319	21,549	--	Spain 9,250; Republic of South Africa 5,350.
Oxides	95	1,348	--	Romania 757; U.S.S.R. 300.
Ash and residue containing lead	14,026	11,444	--	France 7,883; Belgium-Luxembourg 3,322.
Metal including alloys:				
Scrap	180	496	--	United Kingdom 267; West Germany 173.
Unwrought	4,436	4,472	(2)	Turkey 2,049; Libya 1,227.
Semimanufactures	1,266	429	28	Saudi Arabia 244; Libya 60.
Magnesium: Metal including alloys:				
Scrap	856	1,059	441	West Germany 399; France 153.
Unwrought	6,832	6,308	229	West Germany 4,209; Belgium-Luxembourg 682.
Semimanufactures	351	385	(2)	France 201; West Germany 66.
Manganese:				
Ore and concentrate, metallurgical-grade	1,312	1,345	--	France 1,223; West Germany 97.
Oxides	107	21	--	Yugoslavia 5; Uruguay 4.
Metal including alloys, all forms	42	13	NA	NA.
Mercury 76-pound flasks	1,421	2,862	10	India 812; West Germany 667.
Molybdenum:				
Ore and concentrate	209	348	--	Austria 338.
Metal including alloys, all forms	6	20	(2)	Ethiopia 13; West Germany 6.
Nickel:				
Matte and speiss	24	440	--	Spain 344; West Germany 72.
Ash and residue containing nickel	--	162	--	Austria 79.
Metals including alloys:				
Scrap	318	290	--	West Germany 129; India 50.
Unwrought	131	210	--	Netherlands 128; Yugoslavia 37.
Semimanufactures	631	618	19	Yugoslavia 110; France 104.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	[r]144,165	60,026	18,680	West Germany 12,893; Hungary 7,234.
Selenium, elemental	4	3	--	West Germany 2.
Silver: Metal including alloys, unwrought and partly wrought thousand troy ounces	3,697	1,833	NA	Switzerland 1,209; West Germany 113.
Tellurium and arsenic, elemental	53	(2)	--	NA.
Tin:				
Ore and concentrate	--	28	--	All to Austria.
Metal including alloys:				
Scrap	121	51	--	United Kingdom 28; Netherlands 10.
Unwrought	112	345	1	France 69; Netherlands 67.
Semimanufactures	104	125	2	Somalia 58; Cyprus 18.
Titanium:				
Ore and concentrate	54	1,174	--	Hungary 644; Yugoslavia 301.
Oxides	1,965	1,597	147	Republic of Korea 1,056; Yugoslavia 255.

See footnotes at end of table.

Table 2.—Italy: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Titanium —Continued				
Metal including alloys:				
Scrap	30	9	NA	West Germany 4.
Unwrought	5	9	--	All to United Kingdom.
Semimanufactures	28	115	1	Argentina 89; Switzerland 5.
Tungsten: Metal including alloys:				
Scrap	21	32	5	Belgium-Luxembourg 10; West Germany 10.
Unwrought	24	9	--	NA.
Semimanufactures	51	24	--	Belgium-Luxembourg 7; Switzerland 3.
Uranium and thorium: Metal including alloys, all forms:				
Uranium	1	1	NA	NA.
Thorium	--	22	NA	NA.
Vanadium:				
Oxides and hydroxides	9	26	--	NA.
Ash and residue containing vanadium	--	1,484	936	NA.
Metal including alloys, all forms	3	4	NA	NA.
Zinc:				
Ore and concentrate	582	7,866	2	Austria 7,720; West Germany 74.
Blue powder	826	1,086	--	West Germany 705; France 149.
Matte	5,274	4,470	NA	France 4,400.
Metal including alloys:				
Scrap	3,432	2,927	--	West Germany 2,031; Belgium-Luxembourg 354.
Unwrought	20,569	25,455	1,023	Netherlands 13,425; France 3,569.
Semimanufactures	4,362	2,577	--	France 983; Nigeria 333.
Zirconium:				
Ore and concentrate	2,925	5,305	--	Hungary 3,998; France 343.
Metal including alloys, all forms	80	11	NA	NA.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	112,653	169,494	327	United Kingdom 96,280; Algeria 43,392.
Artificial:				
Corundum	1,410	1,505	([2])	Bulgaria 872; West Germany 189.
Silicon carbide	9,929	10,412	NA	West Germany 3,622; France 1,949.
Dust and powder of precious and semiprecious stones including diamond kilograms	56	132	NA	U.S.S.R. 31; Switzerland 15.
Grinding and polishing wheels and stones	23,537	21,491	417	France 2,788; Saudi Arabia 1,478.
Asbestos, crude	51,245	48,647	--	West Germany 17,681; France 4,912.
Barite and witherite	67,135	71,914	20,710	Egypt 29,920; Venezuela 5,120.
Boron materials: Crude natural borates	7,332	2,665	--	Netherlands 1,525; Yugoslavia 1,033.
Bromine	([2])	25	--	All to Belgium-Luxembourg.
Cement	623,045	552,275	--	Libya 189,975; Switzerland 99,762.
Chalk	667	581	--	Switzerland 439; Greece 96.
Clays, crude:				
Andalusite, kyanite, sillimanite	177	64	NA	NA.
Bentonite	36,297	21,261	NA	France 7,199; West Germany 3,539.
Chamotte earth	3,500	2,707	NA	Tunisia 2,096.
Kaolin	20,564	23,859	NA	France 19,440; Switzerland 792.
Unspecified	4,555	2,479	NA	Libya 178.
Cryolite and chiolite	25	3	--	All to Jordan.
Diamond:				
Gem, not set or strung carats	214,915	4,294,952	NA	Switzerland 19,516; unspecified 4,274,189.
Industrial do.	232,358	28,740	NA	Belgium-Luxembourg 3,758.
Diatomite and other infusorial earth	1,627	2,586	--	Austria 1,177; Switzerland 510.
Feldspar, fluorspar, related materials	122,063	98,260	34,903	West Germany 29,367; Switzerland 12,549.
Fertilizer materials:				
Crude, n.e.s	15,735	17,444	--	France 9,980; Switzerland 1,962.
Manufactured:				
Ammonia	39,205	34,597	--	Israel 32,918; Switzerland 224.
Nitrogenous	1,013,991	383,218	--	Greece 68,408; Brazil 63,575.
Phosphatic	21,399	2,191	--	Switzerland 1,963; Austria 146.
Potassic	40,649	39,895	--	Greece 15,919; Romania 15,460.
Unspecified and mixed	368,695	338,914	--	Zambia 50,850; China 49,826.
Graphite, natural	1,649	1,823	1	France 1,274; West Germany 187.
Gypsum and plaster	13,800	11,268	--	Switzerland 8,258; Israel 539.
Lime	47,505	50,834	--	Switzerland 35,376; France 11,818.
Magnesium compounds:				
Magnesite	90,325	37,504	33	Austria 19,130; Netherlands 14,170.
Oxides and hydroxides	--	1,059	--	Netherlands 636; Spain 298.

See footnotes at end of table.

Table 2.—Italy: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Mica:				
Crude including splittings and waste	747	1,223	4	France 456; Belgium-Luxembourg 136.
Worked including agglomerated splittings	53	13	(2)	Spain 7; United Kingdom 2.
Phosphates, crude	213	5,273	--	Denmark 4,840; West Germany 167.
Pigments, mineral:				
Natural, crude	NA	232	NA	NA.
Iron oxides and hydroxides, processed	2,603	4,202	12	France 1,974; West Germany 660.
Potassium salts, crude	--	51	--	Austria 25; West Germany 24.
Precious and semiprecious stones other than diamond:				
Natural kilograms	[r]32,240	4,024	NA	West Germany 2,860; Austria 657.
Synthetic do.	14,423	333	NA	West Germany 78; France 64.
Pyrite, unroasted	30,355	3,733	--	West Germany 1,759; France 599.
Salt and brine	393,955	474,284	14,500	Sweden 83,865; Greece 52,480.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	16,506	21,146	--	Israel 10,771; Greece 7,387.
Sulfate, manufactured	8,744	2,129	NA	Tunisia 750; Saudi Arabia 259.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	503,273	474,071	12,570	Saudi Arabia 60,522; West Germany 58,437.
Worked	1,216,789	1,263,556	106,330	West Germany 392,299; Saudi Arabia 234,725.
Dolomite, chiefly refractory-grade	33,466	31,723	--	Switzerland 15,749; West Germany 2,992.
Gravel and crushed rock	648,204	608,218	939	Switzerland 89,634; Kuwait 78,799.
Limestone other than dimension	497	200	--	Switzerland 171; Syria 21.
Quartz and quartzite	35,725	33,068	133	Switzerland 16,821; France 8,599.
Sand other than metal-bearing	25,936	14,083	33	Switzerland 4,062; Romania 2,500.
Sulfur:				
Elemental:				
Crude including native and byproduct	3,094	4,912	28	Yugoslavia 2,829; France 983.
Colloidal, precipitated, sublimed	195	150	--	Lebanon 64; Czechoslovakia 34.
Dioxide	563	1,160	NA	Belgium-Luxembourg 702; Spain 49.
Sulfuric acid	71,261	39,336	--	Yugoslavia 11,897; Belgium-Luxembourg 7,832.
Talc, steatite, soapstone, pyrophyllite	52,180	46,082	2,779	West Germany 11,347; France 10,617.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	3,541	991	--	Libya 451; Iraq 122.
Carbon: Carbon black	44,069	45,214	--	Yugoslavia 17,621; Austria 7,874.
Coal:				
Anthracite	[r]11,417	3,608	--	France 3,405.
Bituminous	8,360	882	--	Yugoslavia 299; Austria 233.
Briquets of anthracite and bituminous coal	21	91	--	NA.
Lignite including briquets	29	--		
Coke and semicoke	642,038	377,662	--	Romania 250,275; Iran 27,307.
Gas, natural thousand cubic feet	1,874	578	--	NA.
Petroleum:				
Crude thousand 42-gallon barrels	--	255	--	All to West Germany.
Refinery products:				
Liquefied petroleum gas do.	2,041	2,572	144	Greece 523; France 500.
Gasoline do.	35,710	35,518	1,934	France 12,674; Libya 3,613.
Mineral jelly and wax do.	48	48	(2)	West Germany 11; Republic of South Africa 8.
Kerosine and jet fuel do.	16,492	24,373	266	Greece 2,356; bunkers 6,983.
Distillate fuel oil do.	31,020	34,438	45	Saudi Arabia 6,051; Iran 4,158.
Lubricants do.	3,488	4,024	288	Belgium-Luxembourg 377; bunkers 376.
Residual fuel oil do.	28,004	32,800	1,246	Netherlands 4,728; bunkers 12,432.
Bitumen and other residues do.	1,006	1,066	--	Austria 452; Switzerland 197.
Bituminous mixtures do.	39	29	(2)	Netherlands 10; Libya 6.
Petroleum coke do.	66	62	--	Switzerland 45; Yugoslavia 17.

[r]Revised. NA Not available.

[1]Table prepared by Jozef Plachy.

[2]Less than 1/2 unit.

Table 3.—Italy: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	4,663	4,136	1	West Germany 2,813; France 868.
Alkaline-earth metals	^{r}50	29	--	West Germany 22.
Aluminum:				
Ore and concentrate thousand tons	1,709	1,578	--	Australia 1,198; Guinea 191.
Oxides and hydroxides	169,811	69,545	346	France 22,798; West Germany 21,830.
Ash and residue containing aluminum	65,986	98,170	NA	Austria 76,269; West Germany 3,627.
Metal including alloys:				
Scrap	56,610	94,224	1,801	Austria 24,325; West Germany 21,067; France 17,863.
Unwrought	208,829	211,153	198	West Germany 48,882; France 37,771; Greece 30,733.
Semimanufactures	83,018	85,324	3,993	West Germany 37,618; France 22,335.
Antimony: Metal including alloys, all forms	81	252	NA	Belgium-Luxembourg 56; Netherlands 48; Peru 48.
Bismuth: Metal including alloys, all forms	35	39	NA	United Kingdom 25; Netherlands 6.
Cadmium: Metal including alloys, all forms	85	38	NA	NA.
Cesium and rubidium: Metal including alloys, all forms	15	4	--	NA.
Chromium:				
Ore and concentrate	91,806	159,431	--	Albania 88,192; Republic of South Africa 30,875; Turkey 26,208.
Oxides and hydroxides	1,840	1,675	(2)	West Germany 1,237; France 224.
Metal including alloys, all forms	175	124	NA	United Kingdom 73; France 37.
Cobalt: Metal including alloys, all forms	209	252	5	France 69; West Germany 50; Belgium-Luxembourg 36.
Copper:				
Ore and concentrate	11	491	--	All from Republic of South Africa.
Matte and speiss including cement copper	177	194	--	France 186.
Oxides and hydroxides	350	396	NA	Norway 250; West Germany 69.
Sulfate	8,773	5,647	NA	Yugoslavia 5,026; United Kingdom 272.
Ash and sulfate containing copper	6,985	3,887	NA	Australia 3,460.
Metal including alloys:				
Scrap	59,336	71,728	108	France 24,341; United Kingdom 18,786; West Germany 18,038.
Unwrought	329,332	326,139	220	Chile 100,551; Zambia 71,611.
Semimanufactures	104,890	103,453	243	West Germany 32,770; France 31,624.
Gallium: Metal including alloys, all forms kilograms	1,400	900	NA	United Kingdom 700.
Germanium: Metal including alloys, all forms value, thousands	$264	$86	NA	NA.
Gold: Metal including alloys, unwrought and partly wrought thousand troy ounces	4,507	6,497	3	Republic of South Africa 3,035; Switzerland 2,788.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	15,196	16,066	38	Brazil 4,597; Liberia 3,416; Venezuela 1,833.
Pyrite, roasted	14,458	87	--	West Germany 28; Netherlands 25.
Metal:				
Scrap thousand tons	5,540	5,571	42	France 2,189; West Germany 1,969.
Pig iron, cast iron, related materials	^{r}361,244	425,148	65	West Germany 78,011; Algeria 70,306.
Ferroalloys:				
Ferrochromium	73,433	85,215	NA	Zimbabwe 31,362; Republic of South Africa 22,543.
Ferromanganese	99,711	114,113	--	France 39,534; Republic of South Africa 36,505.
Ferromolybdenum	799	1,355	NA	Belgium-Luxembourg 405; Austria 337.
Ferronickel	11,671	15,331	NA	France 11,730; New Caledonia 2,755.
Ferrosilicochromium	1,960	2,497	--	France 1,820; Zimbabwe 321.
Ferrosilicomanganese	28,784	34,701	NA	Norway 18,982; Republic of South Africa 10,171.
Ferrosilicon	55,103	54,864	57	Norway 15,725; France 14,286.
Silicon metal	5,771	5,466	1	France 2,241; Republic of South Africa 834.
Unspecified	7,058	8,593	289	France 2,448; Brazil 1,599.

See footnotes at end of table.

Table 3.—Italy: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Steel, primary forms thousand tons	2,330	2,450	24	France 754; Belgium-Luxembourg 382.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	778	792	1	France 252; West Germany 170.
Universals, plates, sheets do	1,345	1,283	26	France 372; Belgium-Luxembourg 246.
Hoop and strip do	140	178	1	West Germany 66; France 59.
Rails and accessories do	78	106	1	Netherlands 26; West Germany 22.
Wire do	57	52	(2)	Belgium-Luxembourg 22; West Germany 8.
Tubes, pipes, fittings do	226	206	3	West Germany 71; France 62.
Castings and forgings rough do	9	7	(2)	West Germany 2; Switzerland 1.
Lead:				
Ore and concentrate	24,373	275	270	Thailand 4.
Metal including alloys:				
Scrap	15,267	24,626	5	United Kingdom 5,221; France 5,184.
Unwrought	132,783	128,363	1,123	West Germany 30,490; Morocco 27,216.
Semimanufactures	1,458	2,152	2	Yugoslavia 1,420; Belgium-Luxembourg 451.
Lithium: Oxides and hydroxides	293	120	NA	U.S.S.R. 40; West Germany 32.
Magnesium: Metal including alloys:				
Scrap	1,758	1,589	--	West Germany 689; France 344.
Unwrought	638	843	20	Norway 364; France 143.
Semimanufactures	178	644	228	France 213; Belgium-Luxembourg 65.
Manganese:				
Ore and concentrate, metallurgical-grade	354,225	333,063	--	Gabon 193,607; Republic of South Africa 93,943.
Metal including alloys, all forms	1,711	1,713	NA	France 1,030; Republic of South Africa 537.
Mercury 76-pound flasks	2,350	1,073	29	United Kingdom 522; Turkey 290.
Molybdenum:				
Ore and concentrate	4,522	2,768	242	Netherlands 995; Chile 598.
Metal including alloys:				
Scrap	--	18	18	
Unwrought	5	10	NA	Belgium-Luxembourg 4.
Semimanufactures	115	83	23	Austria 41; Netherlands 9.
Nickel:				
Matte and speiss	1,783	2,045	--	Cuba 959; Canada 326; Austria 263.
Oxides and hydroxides	2,897	2,430	NA	Cuba 1,997; Australia 218.
Metal including alloys:				
Scrap	335	320	3	France 138; West Germany 66.
Unwrought	12,137	17,735	4,892	Netherlands 2,869; Republic of South Africa 2,799.
Semimanufactures	2,424	2,472	327	West Germany 881; United Kingdom 663.
Platinum-group metals: Metals including alloys, unwrought and partly wrought thousand troy ounces	172	177	21	United Kingdom 63; Switzerland 36.
Rare-earth metals	^{r}37	136	--	Austria 50; West Germany 31.
Selenium, elemental	25	14	--	United Kingdom 9.
Silver: Metal including alloys, unwrought and partly wrought thousand troy ounces	17,313	18,979	4,643	United Kingdom 5,298; West Germany 3,440.
Tellurium and arsenic, elemental	65	65	4	Sweden 32.
Tin: Metal including alloys:				
Scrap	12	34	--	Switzerland 28.
Unwrought	4,806	5,067	5	Indonesia 2,141; Malaysia 1,015.
Semimanufactures	223	209	2	West Germany 83; France 71.
Titanium:				
Ore and concentrate	3,917	6,045	NA	Republic of South Africa 4,930.
Oxides	43,205	43,216	262	West Germany 16,801; France 10,940.
Metal including alloys:				
Scrap	1,328	1,336	792	Austria 367; West Germany 121.
Unwrought	108	48	NA	United Kingdom 15; West Germany 3.
Semimanufactures	509	457	89	West Germany 158; Japan 102.

See footnotes at end of table.

Table 3.—Italy: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Tungsten:				
Ore and concentrate	83	36	--	All from Canada.
Metal including alloys:				
Unwrought	36	47	NA	West Germany 24; Indonesia 10.
Semimanufactures	48	53	4	West Germany 13; Denmark 9.
Vanadium:				
Ash and residue containing vanadium	2,747	2,646	--	Austria 1,466; West Germany 1,059.
Metal including alloys, all forms	4	26	NA	West Germany 14; France 4.
Zinc:				
Ore and concentrate	264,585	231,872	1,501	Canada 85,862; Peru 83,225.
Blue powder	1,764	777	NA	West Germany 323; France 309.
Matte	5,784	5,487	NA	West Germany 1,833; Switzerland 1,414.
Metal including alloys:				
Scrap	6,520	6,883	--	France 3,367; West Germany 2,450.
Unwrought	50,092	79,343	30	West Germany 29,778; Netherlands 12,218.
Semimanufactures	2,626	2,585	6	West Germany 1,564; Belgium-Luxembourg 453.
Zirconium:				
Ore and concentrate	55,853	66,919	NA	Australia 59,280; Republic of South Africa 5,122.
Metal including alloys, all forms	79	52	13	NA.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1,618	1,463	125	Greece 1,100; West Germany 73.
Artificial:				
Corundum	26,214	23,601	366	Austria 5,529; West Germany 4,940; France 4,649.
Silicon carbide	11,107	7,739	NA	France 2,007; Switzerland 1,947.
Dust and powder of precious and semiprecious stones including diamond kilograms	1,841	1,730	806	Ireland 746.
Grinding and polishing wheels and stones	3,725	3,556	134	Belgium-Luxembourg 582; West Germany 485.
Asbestos, crude	65,942	56,884	87	Canada 18,570; Republic of South Africa 17,512.
Barite and witherite	9,665	10,328	--	Ireland 5,170; France 3,862.
Boron materials: Crude natural borates	[1]45,850	103,795	18,541	Turkey 66,379; Netherlands 18,020.
Bromine	1,275	2,485	--	Israel 2,023; France 459.
Cement	201,199	173,231	1	Yugoslavia 96,736; France 65,767.
Chalk	14,192	18,407	(2)	France 18,255; Austria 107.
Clays, crude:				
Andalusite, kyanite, sillimanite	7,011	36,215	1,056	West Germany 19,816; Republic of South Africa 12,525.
Bentonite	25,440	42,504	515	Greece 38,567; West Germany 1,258.
Chamotte earth	135,091	94,894	3,873	France 56,077; West Germany 17,491.
Kaolin	646,354	599,598	151,223	United Kingdom 256,528; France 27,495.
Unspecified	672,838	715,642	704	West Germany 482,988; France 127,155.
Cryolite and chiolite	1,336	514	--	Denmark 482; West Germany 26.
Diamond:				
Gem, not set or strung carats	214,085	196,650	NA	Belgium-Luxembourg 129,647; Israel 20,830.
Industrial do	183,934	169,727	--	Belgium-Luxembourg 130,790; Netherlands 15,189.
Diatomite and other infusorial earth	5,019	4,743	369	France 2,880; Iceland 442.
Feldspar, fluorspar, related materials	123,185	82,877	129	France 30,256; Spain 12,060.
Fertilizer materials:				
Crude, n.e.s	4,031	2,290	337	France 1,454; West Germany 177.
Manufactured:				
Ammonia	440,299	259,580	7,992	U.S.S.R. 149,170; Trinidad and Tobago 38,173.
Nitrogenous	158,987	181,095	161	West Germany 56,036; Austria 42,109.
Phosphatic	131,981	123,531	11,100	Tunisia 57,843; France 32,975.
Potassic	552,262	510,906	97	East Germany 114,268; Israel 104,833.
Unspecified and mixed	643,991	627,620	241,685	Tunisia 144,058; Morocco 78,570.
Graphite, natural	4,046	5,117	55	West Germany 2,489; United Kingdom 688.
Gypsum and plaster	21,864	14,923	1,382	West Germany 8,323; Austria 3,328.
Iodine	173	315	--	Japan 149; Chile 110.
Lime	277	336	--	West Germany 249; France 76.

See footnotes at end of table.

Table 3.—Italy: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Magnesite	72,035	61,187	413	Greece 42,815; Austria 10,849.
Mica:				
Crude including splittings and waste	1,261	981	409	France 210; China 100.
Worked including agglomerated splittings	372	346	20	Belgium-Luxembourg 88; West Germany 75.
Nitrates, crude	429	671	--	Czechoslovakia 252; Belgium-Luxembourg 197.
Phosphates, crude thousand tons	1,293	1,162	46	Morocco 689; Israel 149.
Phosphorus, elemental	51	107	--	All from West Germany.
Pigments, mineral:				
Natural, crude	--	404	NA	West Germany 60.
Iron oxides and hydroxides, processed	19,032	17,645	365	West Germany 12,538; Belgium-Luxembourg 1,925.
Potassium salts, crude	12,719	11,341	--	France 10,749.
Precious and semiprecious stones other than diamond:				
Natural kilograms	148,255	69,275	5,163	Brazil 16,672; West Germany 14,177.
Synthetic do.	7,218	3,304	NA	Switzerland 483; West Germany 153.
Pyrite, unroasted	252,901	109,155	7	Norway 60,695; Finland 30,921.
Salt and brine	176,485	313,432	--	France 177,963; Tunisia 101,528.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	73,093	92,088	14,494	Romania 23,535; East Germany 21,637.
Sulfate, manufactured	70,517	87,187	26,198	Austria 22,566; France 15,732.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	602,572	611,967	45,451	Spain 139,321; Finland 120,867.
Worked	4,578	4,634	1	Spain 1,415; Greece 876.
Dolomite, chiefly refractory-grade	1,287	1,658	--	West Germany 786; Netherlands 374.
Gravel and crushed rock	14,386	19,009	(2)	France 7,520; West Germany 6,781.
Limestone other than dimension	168	150	--	All from West Germany.
Quartz and quartzite	43,152	48,489	171	Switzerland 30,357; Greece 7,385.
Sand other than metal-bearing thousand tons	1,166	1,027	(2)	France 660; Belgium-Luxembourg 255.
Sulfur: Elemental:				
Crude including native and byproduct	476,015	375,588	14,047	Canada 151,400; Poland 59,225.
Colloidal, precipitated, sublimed	1,010	1,238	1	West Germany 934; France 182.
Talc, steatite, soapstone, pyrophyllite	25,842	20,479	16	Austria 11,231; France 4,345.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,143	780	732	West Germany 35.
Carbon: Carbon black	28,111	24,758	920	France 14,851; West Germany 4,794.
Coal:				
Anthracite thousand tons	[r]200	295	107	Republic of South Africa 96; U.S.S.R. 57.
Bituminous do.	18,265	17,579	10,140	West Germany 1,423; Poland 1,414.
Lignite including briquets do.	62	79	--	Yugoslavia 40; West Germany 35.
Coke and semicoke do.	120	203	70	France 70; West Germany 34.
Gas, natural million cubic feet	[r]554,150	518,850	--	U.S.S.R. 325,310; Netherlands 193,540.
Petroleum:				
Crude thousand 42-gallon barrels	621,098	570,908	--	Saudi Arabia 146,679; Iran 86,133; Libya 76,957.
Refinery products:				
Liquefied petroleum gas do.	8,156	9,675	665	Saudi Arabia 2,709; West Germany 1,151.
Gasoline do.	18,103	16,545	26	U.S.S.R. 2,398; Kuwait 2,103.
Mineral jelly and wax do.	191	207	4	Hungary 58; West Germany 57.
Kerosine and jet fuel do.	489	242	--	Trinidad and Tobago 76; Bulgaria 58.
Distillate fuel oil do.	13,517	30,712	324	Algeria 12,063; Romania 5,871.
Lubricants do.	1,666	793	48	France 146; West Germany 126.
Residual fuel oil do.	99,147	96,290	2,870	Venezuela 18,701; U.S.S.R. 11,489.
Bitumen and other residues do.	1,325	1,364	1,356	Yugoslavia 8.
Bituminous mixtures do.	11	8	1	Sweden 3; France 2.
Petroleum coke do.	5,359	5,401	4,478	United Kingdom 366; U.S.S.R. 239.

[r] Revised. NA Not available.

[1] Table prepared by Jozef Plachy.

[2] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—Exploration of the Olmedo bauxite deposit on Monte Rosso, about 20 kilometers southwest of Sassari, Sardinia, continued during 1983. Approximately 18,000 drill holes were drilled on a 100- by 100-meter grid. This exploration confirmed reserves of about 40 to 50 million tons of bauxite reportedly similar to bauxite from Australia. In addition to exploration, tests on processing bauxite were performed in the Econminas plant at Porto Vesme, also in Sardinia. Providing that some legal obstacles are removed, bauxite from Olmedo could be produced and processed in the Porto Vesme plant in 1985.

Copper.—At yearend 1983, construction was completed of the first large copper refinery in Italy. The new electrolytic plant, operated by Società per Azioni Minero-Metallurgiche (SAMIM) and located at Porto Marghera, near Venice, had a capacity of 45,000 tons of refined copper per year. Scrap and imported blister were planned as crude material. Reportedly, the plant should reach its designed capacity during 1984.

Iron and Steel.—The recession in Europe affected the steel industry in 1983. Financial difficulties persisted in Government-owned Nuovo Italsider S.p.A., Piombino S.p.A., Dalmine S.p.A., and other companies. To cut losses, plans were made to close about 1.9 million tons per year of pipe-making capacity. Most of the cuts would be made in the welded pipes and tube plants where cuts should reach 50% of the existing capacities. Among others, Moraldi S.p.A. would cut its annual production by 410,000 tons, and Dalmine, by 305,000 tons. The over-capacity of the industry, measured against domestic demand, was constantly present but hitherto relatively high exports have led to high utilization of plants. However, in 1982 and 1983, exports dropped sharply and plant utilization decreased, resulting in the need for closing excessive capacities.

The largest private steel company of Italy, Falck, continued to operate profitably during 1983; the main reason for Falck's positive economic results was low-cost energy available to its steel plants. Falck owned a number of hydropower plants in the northern part of Italy, which supplied about 75% of its electric energy. Implementation of the restructuring program approved by the European Economic Community (EEC) was underway. The plan provides for closing four electric arc furnaces and a blooming mill at Unione by 1985. Unione is one of three works at the Sesto San Giovanni site, north of Milan. At the end of 1983, two 60-ton electric arc furnaces, each capable of producing 180,000 tons of steel per year, were shut down and replaced with a 240,000-ton-per-year furnace. This reduction of capacity should satisfy requirements set by the EEC for cutting steel-producing capacities by member countries. Further, an ingot bay and a blooming mill were closed in October, and a new 125,000-ton-per-year induction reheating furnace went on-stream at the Unione works. In addition, Falck and the Government-owned Dalmine were negotiating a seamless tube pact. If the pact is concluded, Dalmine will produce seamless tubular goods, and Falck will concentrate on production of other pipes. When, and if the pact is signed, Falck's small-diameter seamless pipe mill at Arcore would be closed. At yearend 1983, Falck was involved with other private steel companies in an attempt to obtain the right to operate the state-owned Cornigliano plant.

Lead and Zinc.—Figures for lead and zinc ore and concentrate showed higher production than in 1982. The improved performance resulted from startup of Solamine's Mine, Fenice Campanne, in Sardinia, and from a full year of operation of the Salafossa Mine north of Belluno, near the border with Austria. The Salafossa Mine, operated by Pertusola, was closed during all of 1982 because of a landslide that had damaged the flotation plant near the mine in 1980. At the Salafossa Mine, exploration near the mine was negative, and reserves reportedly will be exhausted within 2 to 4 years at present production rates. At that time, the mine will be closed.

At the Monteponi-San Giovanni Mine in Sardinia, operated by SAMIM, a rush of underground water flooded the deepest levels of the mine and postponed the startup.

At Raibl, the mine operated by SAMIM in the Province of Udine, exploration of the level below the present workings yielded positive results in 1983. Based on the new reserves, a decision was made to deepen the existing mine shafts.

Pyrite.—Two mines, Niccioleta and Campiano-Boccheggiano (Campiano) in Tuscany, operated by SAMIM, produced the bulk of Italian pyrite during the year. At the Campiano Mine, use of horizontal stopes with concrete back filling became the principal mining method. An installation for preparing concrete at the surface was completed, with a shaft and pipe system for delivery of concrete underground. At the Fenice Campanne Mine, a flotation plant started processing complex sulfide ores of copper, lead, and zinc and also started recovering pyrite.

NONMETALS

Asbestos.—The mining of lower levels of the open pit mine at Balangero operated by the Società Amiantifera del Balangero S.p.A. continued. The movable crushing plant and movable conveyor belt based on level 654 continued to deliver ore to the processing plant and transport overburden from the northwest edge of the deposit to the dump, thus preparing new segments of the deposit for production.

Barite.—Lower demand for barite in oil drilling resulted in lower production in Italy. The principal producers, underground mines at Barega and Monte Ega, introduced pneumatic loading, and continued to use the sublevel caving mining method.

Potash.—At the Pasquasia Mine in Sicily, an incline was completed. The incline was fitted with conveyor belts for moving ores and waste, and also a main passage way was used for heavy mining equipment. The incline was the replacement for shaft No. 1, which had to be closed because of frequent wall cavings. The Racalmuto Mine, also in Sicily, had similar difficulties within its shaft. A study was underway to build an incline with conveyors that would serve the Racalmuto Mine and the nearby rock salt mine operated by Italkali S.p.A.

Talc and Graphite.—Talco Graphite di Valchisone S.p.A. produced talc in its mines at Fontane in Piedmont and at the Savenosa, Lasassai, and San Francisco Mines in Sardinia. At the Fontane Mine, the mining method, horizontal underhand stoping with cement back filling, had proven to be effective because large cuts are possible coupled with use of machines for fragmentation. Output of graphite from the Icla Mine in Piedmont was near its end. Reserves were low and the mine was expected to be closed during 1984.

MINERAL FUELS

As in the past, during 1983, Italy remained largely dependent on imported fuels to meet its demand. Domestic output of lignite and natural gas modestly decreased import dependency.

Coal.—A large landslide disrupted normal lignite production in the Allori workings at the Castelnuovo Santa Barbara Mine, which with the closure of the Pietrafita powerplant resulted in lower lignite output.

Petroleum and Natural Gas.—Because Italy was 99% dependent on imported crude oil to meet its demand, efforts to increase output continued. The results of exploration and development drilling of 156 wells, totaling 305,456 meters, led to higher output of crude oil and increased reserves. In addition, seismic works were conducted on land and offshore (6,254 kilometers on land and 13,900 kilometers offshore). At the Vega Field, offshore Sicily, a third well started production.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Italian lire (Lit) to U.S. dollars at the rate for 1983 of Lit1,519=US$1.00.

The Mineral Industry of Japan

By John C. Wu[1]

During the past 5 years (1979-83), Japan's mining industry suffered a steady decline in mine output owing to declining ore grade, high production cost, and chronic industry recession resulting from low-level demand and increasing substitution of industrial raw material. Subsequently, Japan's mineral processing industries also suffered for different reasons in different mineral processing industries. The decline in the aluminum smelting industry was caused by high power costs and increased imports. The iron and steel and ferroalloy industries suffered from increased energy costs, a low level of domestic demand, and increasing imports of steel and ferroalloy products. More recently, the cement and petroleum refining industries began to experience the industry structural depression because of sluggish domestic demand and keen competition. As a result, production capacities of Japan's basic material industries have been cut back substantially, ranging from 15% in steelmaking to 50% in aluminum smelting, based on decisions made according to joint recommendations of the Government and industry. However, the mineral processing industries of copper, lead and zinc, and nickel as well as other minor metals remained steady.

Despite the decline in some of its basic material industries, Japan maintained its position as one of the world's leaders in the production of cement, copper, iodine, iron and steel, titanium, and zinc in 1983. Japan was also a major world producer of limestone and such minor metals as bismuth, cobalt, indium, selenium, and tellurium. Japan emerged as one of the world's major producers of gallium metal when Sumitomo Chemical Co. started commercial operation of a new 10-ton-per-year-capacity plant, the world's largest, in the Ehime Prefecture in October.

During 1980-83, many major mining and mineral processing companies in ferrous, nonferrous, and chemical industries reportedly had diversified some of their operations into production of new industrial raw materials and integrated further into downstream operations. Production of these new industrial raw materials include high-purity aluminum, ceramics, gallium, high-purity silicon metal, strontium, tantalum, titanium dioxide, and zirconium. Downstream operations involved production of titanium mill products, special superalloys, powder metals, and nonferrous alloy mill products.

In line with the Government's policies of building a high-technology industry and securing a short-term (60 days) raw materials supply vital to the Japanese iron and steel, machinery, electronic, and chemical industries, the Government approved a plan in April 1983 to stockpile cobalt, chromium, manganese, molybdenum, nickel, tungsten, and vanadium under three types of programs. These approved programs and supply goals for fiscal years 1983-87 were as follows, in days:

Program	1983	1984	1985	1986	1987
Government	5	10	15	20	25
Joint Government and private sector	5	10	15	20	25
Private sector	2	4	6	8	10
Total	12	24	36	48	60

The Ministry of International Trade and Industry (MITI) will supervise and control the buildup and drawdown of the stockpiles held by the three programs. The private stockpile is to be drawn down first in case of a minicrisis, then the joint stockpile in case of a subcrisis, and finally the Government stockpile in case of a major crisis. According to the Metal Mining Agency of Japan (MMAJ), the supply goal of the seven metals for fiscal year 1983 was achieved as planned. The Government program, 100% financed by the Government, and the joint Government and private sector program, two-thirds financed by the Government and one-third by private sector, were administered by MMAJ; the private sector program, 100% financed by the private sector, was administered by the Japan Rare Metal Association, which consists of 31 member companies. By the end of fiscal year 1983, the 12-day stockpile of all three programs consisted of 17,461 tons of ferrochromium; 3,532 tons of nickel in the forms of nickel metal, ferronickel, and nickel oxide sinter; 57 tons of tungsten concentrate; 475 tons of molybdenum concentrate; 60 tons of cobalt metal; 17,286 tons of ferromanganese; and 196 tons of ferrovanadium.[2] In addition, the Light Metal Stockpiling Association supported by the Government held 146,654 tons of aluminum at yearend 1983, but the Metallic Mineral Stockpiling Association held only 3,969 tons of zinc at yearend 1983 after releasing 56,934 tons during 1983.

During 1982-83, Japan's mineral fuel sector, mainly the coal mining industry, was equally depressed. Since 1975, the output goal of 20 million tons of coal has never been achieved by the industry. On the contrary, coal output declined to 17 million tons. In Hokkaido, where there is a high concentration of coal mines and little alternative job opportunity, about 2,000 coal miners reportedly became unemployed as a result of coal mine closures. The Yubari Mine of Hokkaido had been shut down since a 1982 accident. Various feasibility studies supported and conducted by the Japan Coal Association and local governments of Hokkaido to reopen and redevelop the Yubari Mine were abandoned in July 1983 when MITI disapproved the attempt for safety and economic reasons.

According to the latest annual report of the Economic Planning Agency (EPA) on national accounts, the factor contribution of the mining industry to Japan's gross domestic product (GDP) declined to 0.49% in 1982 from 0.53% in 1980. The factor contribution of the basic metal industry also dropped to 3.03% in 1982 from 3.74% in 1980. Despite the small contribution of the mineral industry to Japan's GDP, the industry remained vital to the Japanese economy because of its significant role in providing raw materials to the important industries in manufacturing, especially the export-oriented industries such as electronic and electric machinery and equipment, heavy machinery and equipment, and transport equipment as well as other advanced industrial products.

In 1983, Japan's economy continued to improve particularly in the areas of price stability and international trade balance. According to EPA's preliminary statistics, Japan's real gross national product (GNP) grew at 3% in 1983 compared with 3.3% (revised) in 1982. The 1983 economic growth was sustained mainly by the growth in exports with sluggish domestic demand and negative growth in gross domestic fixed capital formation.

The growth in export earnings was contributed mostly by the exports of transport equipment, electronic and electric products, and scientific and optical equipment. The sluggish domestic demand was caused by smaller increases in real wages and higher income tax payments. The negative growth in domestic fixed capital formation was a result of cutbacks in industry's production capacity and reduced investments in private housing with stagnant investments in public works projects. Japan's consumer prices increased only 2% in 1983 while real wages rose only 2%. However, the unemployment rate jumped to a 30-year high of 2.7% resulting from production cutbacks in basic material industries. Japan's total labor force was 58.9 million, of which about 1.6 million were unemployed. Japan's GNP in 1975 constant dollars was estimated at $881.8 billion and at current dollars was estimated at $1,152.9 billion for 1983.[3]

PRODUCTION

The performance of Japan's mineral industry was mixed. In the mining sector, mining activities of lead and zinc were at a higher level than that of 1982 because of strong recovery of lead and zinc demand in the domestic market. The activities of other metallic and nonmetallic mining remained stagnant or at a lower level than that of 1982 especially in tungsten mining, which was hit hardest by lower prices and high production costs. Coal mining continued the 1982 downward trend, affected by cheap imported coal and continued shutdown of the Yubari Mine in Hokkaido, while Ja-

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pan's oil and natural gas production increased slightly.

Over the past 2 years, Japan's mining industry was constantly facing problems of declining ore grades, lower metal prices, continuing substitution of industrial raw materials, and increasing production costs. According to MITI's survey, the overall activity of Japan's mining industry was moving downward in terms of the number of operating mines and number of employees, as shown in the following tabulation:

Fiscal year	Number of operating mines		Number of employees	
	Metal	Non-metal	Metal	Non-metal
1980	71	714	11,005	18,768
1981	74	710	11,422	18,483
1982	72	700	10,449	17,869
1983	78	691	9,943	17,048

Production activity of Japan's mineral processing was mostly lower except copper, gold, lead, silver, and zinc in 1983. Production of aluminum reached the lowest level in 20 years while production of cobalt, nickel, and titanium was at a much lower level owing to the slow recovery of domestic and international markets. The Japanese iron and steel industry continued its downward trend resulting from the stagnant steel demand in the domestic market and increased imports of cheap steel products. The manufacturers of cement and chemical fertilizers as well as petroleum refining suffered from structural depression. The output of these industries dropped substantially as a result of drastic cutbacks in capacity and scrapping or closing of facilities and plants.

According to information published by the Japan Productivity Research Institute, production indexes for mining and selected mineral processing industries for 1979, 1981-83 were as follows (1980 equals 100):

Industry	1979	1981	1982	1983
Mining	98.5	97.1	96.2	95.8
Manufacturing	94.1	101.1	101.4	104.9
Iron and steel	96.3	93.6	91.4	89.1
Aluminum	92.6	70.6	32.1	23.5
Copper	97.0	103.5	106.0	107.7
Cement	99.8	96.5	91.7	92.0
Chemical fertilizers	105.1	84.6	80.2	77.4
Coal products	91.1	99.5	97.7	91.6
Petroleum products	107.1	93.3	87.7	85.2

Table 1.—Japan: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983^{p}
METALS					
Aluminum:					
Alumina, gross weight ---- thousand tons	1,545	1,936	1,344	959	1,065
Metal:					
Primary:					
Regular grades ---do	1,006	1,087	765	347	253
High-purity ---do	4	4	6	4	3
Secondary ---do	768	800	840	761	802
Antimony:					
Oxide	6,079	6,482	6,238	6,446	7,596
Metal	512	356	390	260	273
Arsenic, white (equivalent of arsenic acid)	182	284	95	$^{r\ e}$100	^{e}100
Bismuth	458	338	478	486	570
Cadmium	2,597	2,173	1,977	2,034	2,215
Chromium:					
Chromite, gross weight	11,905	13,610	10,959	11,129	8,396
Metal	3,158	3,621	3,625	3,785	2,786
Cobalt metal	2,653	2,867	2,421	1,942	1,371
Columbium and tantalum: Tantalum metal	55	58	53	44	40
Copper:					
Mine output, metal content	59,100	52,553	51,513	50,658	46,037
Metal:					
Blister and anode:					
Primary	853,700	889,500	^{r}930,000	948,200	944,600
Secondary	67,700	^{r}39,800	^{r}50,100	98,100	117,300
Total	921,400	^{r}929,300	^{r}980,100	1,046,300	1,061,900
Refined:					
Primary	853,693	889,497	929,967	948,158	944,551
Secondary	130,007	124,795	120,153	126,816	147,378
Total	983,700	1,014,292	1,050,120	1,074,974	1,091,929

See footnotes at end of table.

Table 1.—Japan: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983[p]
METALS —Continued					
Gallium metal	2	3	3	3	5
Germanium:					
Oxide	15	16	12	10	11
Metal	10	13	11	7	7
Gold:					
Mine output, metal content thousand troy ounces	128	102	99	104	101
Metal do	1,311	1,217	1,214	1,271	1,296
Indium metal do	289	482	482	482	482
Iron and steel:					
Iron ore and iron sand concentrate:					
Gross weight thousand tons	460	477	442	362	298
Iron content do	284	294	274	225	185
Roasted pyrite concentrate (50% or more Fe) do	432	318	308	327	329
Metal:					
Pig iron and blast furnace ferroalloys do	83,826	87,041	80,048	77,658	72,938
Electric-furnace ferroalloys:					
Ferrochrome	365,490	402,997	306,104	328,480	304,053
Ferromanganese	603,019	569,147	567,746	538,355	389,381
Ferronickel	303,716	276,829	244,135	214,523	180,826
Ferrosilicon	319,553	303,754	234,524	192,372	157,939
Silicomanganese	299,680	310,714	282,852	269,379	222,204
Ferrochromium-silicon[2]	12,623	20,531	10,469	9,845	7,152
Other:					
Calcium silicon	3,349	3,859	2,590	3,834	2,357
Ferrocolumbium	1,207	1,159	825	1,039	530
Ferromolybdenum	3,406	4,367	3,056	3,413	3,104
Ferrotungsten	251	242	362	329	200
Ferrovanadium	4,628	3,526	4,063	4,465	2,821
Unspecified	9,298	10,360	3,167	2,309	2,159
Total[3]	1,926,220	1,907,485	1,659,893	1,568,343	1,272,726
Steel, crude thousand tons	111,748	111,395	101,675	99,548	97,164
Semimanufactures, hot-rolled:					
Of ordinary steels do	89,075	88,888	79,797	78,206	77,570
Of special steels do	12,522	12,872	13,281	13,660	13,291
Lead:					
Mine output, metal content	46,929	44,746	46,922	45,873	46,888
Metal, refined:					
Primary	[r]176,209	[r]175,172	[r]175,371	183,132	203,325
Secondary	[r]106,491	[r]129,769	[r]141,646	119,068	118,317
Magnesium metal:					
Primary	11,368	9,252	5,667	5,555	6,026
Secondary	16,382	23,872	28,436	21,670	13,012
Manganese:					
Ore and concentrate:					
Gross weight	87,929	79,579	86,696	78,045	77,043
Manganese content	23,224	19,065	20,953	19,928	20,740
Oxide	36,110	39,487	44,296	45,990	47,181
Metal	4,029	4,431	4,232	3,873	3,940
Molybdenum:					
Metal content of concentrate	70	[e]56	[e]74	[e]97	[e]97
Metal	409	388	388	392	438
Nickel metal:					
Refined	25,031	24,798	23,791	23,328	23,812
Ni content of ferronickel	75,970	73,566	63,008	60,030	45,739
Total	101,001	98,364	86,799	83,358	69,551
Platinum-group metals:					
Palladium metal troy ounces	22,495	28,968	25,748	27,862	37,122
Platinum metal do	12,142	12,366	10,521	15,411	21,460
Rare-earth metals:					
Lanthanum oxide	151	188	227	118	160
Cerium metal	491	670	852	628	[e]600
Selenium, elemental	510	471	428	410	433
Silicon metal	[r]15,187	[r]15,751	[r]11,906	8,124	--
Silver:					
Mine output, metal content thousand troy ounces	8,680	8,603	9,010	9,843	9,877
Metal, primary do	39,104	37,828	40,252	41,573	48,794
Tellurium, elemental	56	69	62	63	[e]65

See footnotes at end of table.

Table 1.—Japan: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983[p]
METALS —Continued					
Tin:					
Mine output, metal content	660	549	561	529	599
Metal, smelter	1,251	1,319	1,315	1,296	1,260
Titanium:					
Slag	180	NA	NA	NA	NA
Metal	13,190	13,961	24,938	16,849	10,590
Tungsten:					
Mine output, metal content	746	668	667	640	473
Metal	1,736	2,055	1,820	1,775	1,842
Uranium metal kilograms	3,377	5,218	2,619	[r] [e]3,000	[e]3,000
Zinc:					
Mine output, metal content	243,354	238,108	242,042	251,356	255,714
Oxide	61,514	63,497	64,735	60,924	64,319
Metal:					
Primary	[r]688,219	[r]629,681	[r]575,645	549,010	579,022
Secondary	[r]128,106	[r]155,423	[r]144,789	159,407	169,974
Zirconium metal	102	84	47	45	[e]50
NONMETALS					
Asbestos	3,502	3,897	3,950	4,135	[e]4,000
Barite	55,722	55,916	56,369	59,492	69,699
Bromine, elemental[e]	12,000	12,000	12,000	12,000	12,000
Cement, hydraulic thousand tons	87,803	87,958	[r]84,827	80,688	80,892
Clays:					
Bentonite	[e]400,000	548,328	511,781	484,431	440,923
Fire clay	1,432,241	1,547,085	1,455,619	1,321,002	1,260,678
Kaolin	218,137	228,255	210,858	197,346	230,720
Feldspar and related materials:					
Feldspar	37,548	29,782	25,620	30,160	30,996
Aplite	394,240	302,749	350,123	349,355	412,454
Gypsum thousand tons	6,273	6,105	6,137	6,363	5,845
Iodine, elemental	6,250	6,525	6,862	7,180	7,273
Lime: Quicklime thousand tons	9,628	9,350	8,026	7,777	7,436
Nitrogen: N content of ammonia do.	2,323	2,149	1,850	1,652	1,546
Perlite[e]	75,000	77,000	75,000	75,000	75,000
Salt, all types thousand tons	1,079	1,112	1,100	1,020	1,200
Sodium compounds, n.e.s.:					
Sodium carbonate	1,354,442	1,355,433	1,177,695	1,162,398	1,104,500
Sodium sulfate	338,467	310,743	284,677	255,969	259,596
Stone, crushed and broken:					
Dolomite thousand tons	6,119	6,206	5,787	4,996	4,386
Limestone do.	182,781	184,780	176,702	168,259	169,753
Sulfur:					
S content of pyrite do.	300	311	293	276	300
Byproduct:					
Of metallurgy do.	1,350	1,300	1,236	1,268	[e]1,270
Of petroleum do.	1,241	1,173	1,080	1,051	[e]1,010
Talc and related materials:					
Talc	120,403	121,670	114,466	99,886	85,241
Pyrophyllite	1,588,461	1,627,128	1,430,585	1,392,418	1,378,707
Vermiculite[e]	16,000	17,000	17,000	17,000	17,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black thousand tons	538	575	557	504	568
Coal:					
Anthracite do.	3	10	34	32	16
Bituminous coal[4] do.	17,640	18,017	17,653	17,576	17,062
Lignite do.	32	27	--	--	--
Total do.	17,675	18,054	[r]17,687	17,608	17,078
Coke including breeze:					
Metallurgical do.	43,189	45,146	44,864	46,520	43,600
Metallurgical breeze do.	2,000	2,318	2,378		
Gashouse including breeze do.	3,226	3,494	3,448	3,261	3,073
Fuel briquets, all grades do.	479	453	376	334	282
Gas, natural:					
Gross[5] million cubic feet	85,250	77,593	74,245	72,305	73,645
Marketed do.	83,455	75,545	71,594	70,440	72,432
Natural gas liquids:					
Natural gasoline[e] thousand 42-gallon barrels	37	37	37	37	37
Liquefied petroleum gas from natural gas (field plants only)[e] do.	300	300	300	300	300
Peat[e]	60	60	60	60	60

See footnotes at end of table.

Table 1.—Japan: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983[p]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum:					
Crude ______ thousand 42-gallon barrels__	3,522	3,169	2,868	2,937	3,095
Refinery products:					
Gasoline:					
Aviation ______________do____	138	88	101	101	82
Other ________________do____	215,910	214,614	219,168	222,489	223,590
Jet fuel _________________do____	26,669	28,839	28,273	27,109	27,933
Kerosine ________________do____	193,537	178,718	174,548	169,825	168,982
Distillate fuel oil ___________do____	135,652	135,633	134,476	113,581	144,936
Residual fuel oil ____________do____	779,628	697,507	601,412	528,299	485,258
Lubricants _______________do____	12,277	12,636	11,806	10,774	11,517
Asphalt and bitumen ________do____	30,618	28,411	27,078	27,078	29,682
Liquefied petroleum gas_______do____	52,413	47,067	47,475	45,890	48,733
Naphtha _________________do____	118,563	110,512	92,403	71,804	72,509
Paraffin _________________do____	1,195	1,101	1,101	1,025	981
Petroleum coke _____________do____	503	692	717	761	717
Unfinished oils _____________do____	45,362	44,557	12,076	NA	4,478
Refinery fuel and losses _______do____	83,441	[6]110,411	113,002	118,708	88,591
Total _______________do____	1,695,906	1,610,786	1,463,636	1,337,444	1,307,989

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through Aug. 2, 1984.

[2] For reasons not evident in sources, these figures are reported as negative numbers. (See also footnote 3.)

[3] Sum of listed detail as reported, but adding quantity bearing footnote 2 as positive numbers. Japanese sources provide the following totals for ferroalloy output in the years indicated: 1979—1,900,974; 1980—1,866,423; 1981—1,638,955; 1982—1,548,653; and 1983—1,258,422. These totals represent the sum of listed detail using the quantities bearing footnote 2 as negative numbers, thereby not only omitting the footnoted numbers, but actually subtracting them from the sum of all other alloys. The reason for this procedure in source publications is not explained.

[4] Includes coking coal and steam coal.

[5] Includes output from gas wells and coal mines.

[6] May include some additional unfinished oils.

TRADE

In 1983, Japan achieved a record merchandise trade balance of $20.5 billion with improvements in both export earnings and import bills. A 5.8% increase in export earnings to $146.9 billion was contributed mainly by a 10% increase in exports of machinery and equipment that accounted for over 67% of export earnings. The main export commodities in machinery and equipment were motor vehicles, $26.1 billion; tape recorders, $6.6 billion; vessels, $6 billion; scientific and optical equipment, $5.4 billion; office machinery, $5.1 billion; power generating machinery, $3 billion; and motorcycles, $2.1 billion. Imports were reduced by 4.2% to $126.4 billion resulting from a 10.2% decrease in imports of mineral fuels that accounted for 46.6% of overall import bills. Imports of coal dropped 15.6% to $4.9 billion, and imports of crude oil declined by 13.4% to $40.1 billion resulting from lower imported quantities and unit prices reflecting reduced domestic demand for energy and further softening of the world's coal and oil markets.

The short-term trend in Japan's export earnings and import costs for selected major commodity groups during 1981-83 are summarized as follows, in million dollars:

	1981	1982	1983
Exports:			
Iron and steel products __	16,669	15,645	12,843
Nonferrous metals _____	1,467	1,282	1,588
Metal products _______	4,320	4,287	3,941
Nonmetallic mineral products __________	2,122	1,945	2,150
Chemical fertilizers ____	355	210	120
Imports:			
Iron ore____________	3,504	3,630	3,147
Iron and steel products __	1,067	1,216	1,349
Nonferrous metal ores___	3,011	2,530	2,403
Nonferrous metals _____	4,189	3,885	4,127
Nonmetallic mineral ores_	975	969	991
Coal_______________	5,521	5,782	4,877
Petroleum: Crude and partly refined _________	53,343	46,274	40,063
Petroleum products ____	5,331	5,135	5,642

In the mineral commodity trade, China and the United States were the major buyers of iron and steel products in 1983. The United States, the Republic of Korea, Taiwan, Hong Kong, Singapore, and Saudi

Arabia were the principal customers of Japan's nonferrous metals, metal products, and nonmetallic mineral products. Australia, Brazil, and India were the principal suppliers of iron ore. In recent years, the Republic of Korea, Brazil, and Taiwan became the important suppliers of iron and steel products to Japan. The major suppliers of Japan's nonferrous metal ore, metals, and nonmetallic mineral ores included the United States, the Republic of South Africa, Australia, Canada, Chile, Peru, the U.S.S.R., China, the Philippines, Indonesia, Malaysia, New Caledonia, and Mexico. Most imported coal was from Australia, the United States, Canada, the Republic of South Africa, and China while imports of petroleum were mostly from the Middle East region led by Saudi Arabia, the United Arab Emirates, and Iran.

Based on overall trade, the United States remained the single most important trade partner of Japan in 1983. Japanese exports to the United States accounted for 29% of export earnings, while Japanese imports from the United States accounted for 19.5% of total imports.

Table 2.—Japan: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	902	377	18	Taiwan 252; Malaysia 40; Republic of Korea 24.
Aluminum:				
Oxides and hydroxides	412,100	339,719	24,699	Canada 172,277; Republic of Korea 55,832; China 31,071.
Metal including alloys:				
Scrap	453	630	--	Republic of Korea 605.
Unwrought	12,160	6,681	10	Australia 3,718; Republic of Korea 1,914; Thailand 493.
Semimanufactures	114,326	155,714	84,570	China 11,374; Indonesia 11,081; Taiwan 8,967.
Bismuth: Metal including alloys, all forms	253	242	12	U.S.S.R. 86; West Germany 65; India 37.
Cadmium: Metal including alloys, all forms	^{r}938	1,145	--	U.S.S.R. 451; East Germany 208; Austria 100.
Chromium:				
Ore and concentrate	607	744	--	Republic of Korea 697.
Oxides and hydroxides	2,268	2,427	352	Republic of Korea 742; Taiwan 690; Kuwait 150.
Cobalt: Oxides and hydroxides	13	10	1	Republic of Korea 2; Thailand 2; Vietnam 2.
Columbium and tantalum: Metal including alloys, all forms, tantalum	26	9	3	Austria 2; West Germany 2.
Copper:				
Sulfate	340	379	--	Taiwan 294; Indonesia 50.
Metal including alloys:				
Scrap	38,434	45,037	17	China 11,671; Republic of Korea 10,187; Taiwan 9,143.
Unwrought	4,873	3,793	1	Republic of Korea 3,142; Taiwan 456.
Semimanufactures	190,068	203,252	30,330	Taiwan 27,321; Hong Kong 26,428; Singapore 18,292.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	105,490	468,079	84,884	United Kingdom 247,784; Switzerland 94,161; Hong Kong 40,537.
Iron and steel: Metal:				
Scrap	186,783	174,787	9,265	Republic of Korea 93,272; Taiwan 35,491; Hong Kong 12,468.
Pig iron, cast iron, related materials	11,896	60,785	2,077	India 31,050; Hong Kong 11,844; Thailand 5,937.
Ferroalloys:				
Ferromanganese	34,866	26,683	2,000	North Korea 13,892; Republic of Korea 4,614; Taiwan 2,498.
Unspecified	28,971	27,274	7,922	Netherlands 13,129; North Korea 2,692; Republic of Korea 1,077.
Steel, primary forms thousand tons	2,854	2,547	221	Republic of Korea 271; China 261; Taiwan 256; Iran 216.

See footnotes at end of table.

Table 2.—Japan: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel: Metal —Continued				
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	6,808	7,892	647	Saudi Arabia 1,696; Hong Kong 471; Republic of Korea 326.
Universals, plates, sheets do	9,947	9,775	1,185	China 1,960; Indonesia 574; U.S.S.R. 549.
Hoop and strip do	596	578	62	China 107; Indonesia 54; U.S.S.R. 39; Taiwan 35.
Rails and accessories do	144	166	93	Indonesia 12; China 11; Taiwan 11.
Wire do	275	254	78	Saudi Arabia 24; Australia 15; Hong Kong 12.
Tubes, pipes, fittings do	5,201	7,233	1,620	U.S.S.R. 1,571; Saudi Arabia 433; China 339.
Castings and forgings, rough do	34	30	12	Singapore 4; Malaysia 3.
Lead:				
Ore and concentrate	7,810	4,807	--	All to North Korea.
Oxides	108	79	--	Singapore 43; Republic of Korea 13; Indonesia 12.
Metal including alloys, all forms	4,184	8,022	8	Taiwan 2,173; North Korea 1,948; Republic of Korea 1,457.
Magnesium: Metal including alloys, all forms	72	67	1	North Korea 40; Taiwan 19.
Manganese:				
Ore and concentrate	991	1,557	--	Republic of Korea 741; Taiwan 239; Pakistan 213.
Oxides	27,540	31,489	14,552	Indonesia 3,084; Philippines 1,625; Republic of Korea 1,504.
Mercury 76-pound flasks	6,917	7,296	4,954	Netherlands 821; Republic of Korea 586; North Korea 300.
Molybdenum: Metal including alloys, all forms	54	54	(2)	Hungary 28; U.S.S.R. 10; West Germany 5.
Nickel:				
Ore and concentrate	3,600	--		
Metal including alloys, all forms	1,804	1,438	324	U.S.S.R. 241; Taiwan 212; Republic of Korea 203.
Platinum-group metals:				
Waste and sweepings value	$100,041	$13,965	--	All to United Kingdom.
Metals including alloys, unwrought and partly wrought troy ounces	178,194	186,072	27,803	Taiwan 86,021; Qatar 52,727.
Selenium, elemental	247	204	44	Netherlands 43; United Kingdom 39; India 13.
Silver: Metal including alloys, unwrought and partly wrought thousand troy ounces	4,981	4,441	996	United Kingdom 1,662; Taiwan 580; Republic of Korea 398.
Tin:				
Oxides	24	25	--	China 15; Republic of Korea 5; Indonesia 3.
Metal including alloys, all forms	439	1,812	1	Thailand 777; Saudi Arabia 196; Yemen (Sanaa) 99.
Titanium:				
Oxides	16,353	16,544	1,207	China 5,965; Taiwan 4,319; Republic of Korea 2,175.
Metal including alloys, all forms	10,034	3,711	882	France 1,170; United Kingdom 1,075; Netherlands 210.
Tungsten: Metal including alloys, all forms	212	286	147	U.S.S.R. 52; Taiwan 26; Republic of Korea 20.
Zinc:				
Oxides	480	913	109	Vietnam 258; Thailand 200; Taiwan 113.
Metal including alloys, all forms	55,582	45,699	11	Taiwan 11,327; Philippines 8,134; China 7,610.

See footnotes at end of table.

Table 2.—Japan: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1,916	2,461	23	Hong Kong 1,299; Republic of Korea 601; Taiwan 271.
Artificial: Corundum	15,138	17,149	63	Republic of Korea 8,686; Taiwan 4,294; Australia 1,523.
Dust and powder of precious and semiprecious stones including diamond thousand carats	1,692	3,223	1,234	Republic of Korea 1,853.
Grinding and polishing wheels and stones	7,336	7,067	1,011	Singapore 889; Hong Kong 775; Thailand 702.
Asbestos, crude	680	723	--	Republic of Korea 526; China 103.
Barite and witherite	4,768	4	--	All to Zambia.
Boron materials:				
Crude natural borates	1,424	1,230	--	Republic of Korea 670; Taiwan 559.
Oxides and acids	147	106	(2)	Republic of Korea 72; Taiwan 24.
Cement thousand tons	10,011	11,348	58	Saudi Arabia 3,022; Kuwait 2,956; Singapore 1,714.
Clays, crude	59,961	65,385	--	Taiwan 32,820; Republic of Korea 13,916; Indonesia 7,796.
Diamond:				
Gem, not set or strung carats	324	1,038	--	Republic of Korea 505; Thailand 340; Belgium-Luxembourg 154.
Industrial do	2,098	6,123	1,165	Singapore 4,175.
Diatomite and infusorial earth	2,321	2,165	--	Taiwan 809; Cuba 300; Vietnam 200.
Feldspar	18,766	24,246	--	Taiwan 22,717.
Fertilizer materials: Manufactured:				
Ammonia	9,717	23,102	--	Republic of Korea 16,053; Philippines 5,963.
Nitrogenous thousand tons	1,436	1,080	23	China 470; Thailand 142; Malaysia 79.
Phosphatic	35,472	9,205	--	Malaysia 3,100; Taiwan 1,753; Singapore 1,400.
Potassic	8,218	1,092	15	North Korea 1,000.
Unspecified and mixed	75,338	149,622	685	Thailand 61,599; China 24,884; Sri Lanka 16,002.
Fluorspar	326	486	--	Vietnam 240; Malaysia 92.
Graphite, natural	1,620	2,084	30	Taiwan 1,006; Republic of Korea 286; Cuba 204.
Gypsum and plaster	7,628	9,173	24	Republic of Korea 4,012; Taiwan 1,705; Indonesia 1,548.
Iodine including bromine and fluorine	5,442	5,199	1,640	United Kingdom 936; West Germany 695; France 661.
Lime	25,079	20,193	--	Papua New Guinea 17,350; Australia 2,284.
Magnesium compounds:				
Magnesite	88,487	95,325	441	U.S.S.R. 28,648; Republic of Korea 25,585; Australia 10,433.
Oxides and hydroxides	5,860	6,103	1,439	West Germany 1,388; Taiwan 900; United Kingdom 349.
Mica, all forms	1,145	840	25	Hong Kong 429; Taiwan 215.
Pigments, mineral:				
Natural, crude	61	66	--	Hong Kong 17; Singapore 15; Republic of Korea 12.
Iron oxides and hydroxides, processed	14,875	13,066	1,198	Taiwan 5,235; U.S.S.R. 1,174; Republic of Korea 1,140.
Precious and semiprecious stones other than diamond:				
Natural kilograms	42,833	20,150	--	Hong Kong 12,801; Republic of Korea 5,505; West Germany 713.
Synthetic do	43,933	37,391	3,878	Malaysia 14,461; Republic of Korea 4,983; Taiwan 4,676.
Salt and brine	1,173	1,609	597	North Korea 471; Maldives 131.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	61,318	40,854	4	Indonesia 19,146; Philippines 11,706; Papua New Guinea 3,265.
Sulfate, manufactured	31,981	9,413	--	Mozambique 2,500; Philippines 1,953; Malaysia 1,950.

See footnotes at end of table.

Table 2.—Japan: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel:				
Dimension stone	1,640	6,612	115	Iraq 3,651; Kuwait 1,819; Republic of Korea 678.
Dolomite, chiefly refractory-grade	3,446	5,093	--	Indonesia 3,330; Taiwan 991; Philippines 617.
Gravel and crushed rock	96,378	95,102	33	Australia 90,300.
Limestone other than dimension	1,263,034	991,670	17	Australia 910,999; Singapore 36,329; Hong Kong 34,751.
Quartz and quartzite	675	3,824	38	Australia 3,187.
Sand other than metal-bearing	8,018	3,703	--	Taiwan 1,759; Republic of Korea 628; Libya 394.
Sulfur:				
Elemental:				
Crude including native and byproduct	231,326	299,451	--	Republic of Korea 238,232; Taiwan 58,192.
Colloidal, precipitated, sublimed	174	200	--	Republic of Korea 65; Thailand 41; Indonesia 34.
Sulfuric acid	576,682	788,953	64,676	Mexico 271,572; Republic of Korea 140,364; China 102,591.
Talc, steatite, soapstone, pyrophyllite	1,923	2,032	1	Taiwan 805; Republic of Korea 796; Indonesia 172.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	13,246	10,865	75	Indonesia 3,543; Republic of Korea 1,343; Singapore 1,179.
Coal, all grades including briquets	55,004	25,376	--	Republic of Korea 17,263; Philippines 6,879.
Coke and semicoke thousand tons	1,961	1,745	--	United Kingdom 472; Romania 344; Philippines 307.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	22	3	(2)	Hong Kong 2.
Gasoline do	60	52	--	Taiwan 34; Philippines 16.
Mineral jelly and wax do	592	563	48	Republic of South Africa 190; Republic of Korea 66; Algeria 51.
Kerosine and jet fuel do	51	48	--	Republic of Korea 39; Australia 8.
Lubricants do	1,327	1,221	63	Republic of Korea 331; Taiwan 224; U.S.S.R. 161; Pakistan 147.
Residual fuel oil do	1,547	16	16	
Bituminous mixtures do	18	42	--	Indonesia 23; Philippines 9.
Petroleum coke do	226	225	18	U.S.S.R. 92; United Kingdom 41; Brazil 28.

[r] Revised.

[1] Excludes exports under Japanese-United States Mutual Defense Agreement or for account of U.S. military forces. Table prepared by Audrey D. Wilkes.

[2] Less than 1/2 unit.

Table 3.—Japan: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkaline-earth metals	162	80	63	China 13; West Germany 3.
Unspecified	447	197	37	France 116.
Aluminum:				
Ore and concentrate thousand tons	4,352	3,439	3	Australia 2,150; Indonesia 732; Malaysia 408.
Oxides and hydroxides	640	4,661	1,903	France 1,281; China 683; West Germany 619.
Metal including alloys:				
Scrap	204,863	181,667	123,032	Australia 17,188; Hong Kong 14,803; Canada 6,586.
Unwrought thousand tons	1,129	1,447	306	Venezuela 199; Canada 193; Australia 112.
Semimanufactures	31,088	30,196	5,194	Romania 5,244; France 4,097; Spain 3,944.

See footnotes at end of table.

Table 3.—Japan: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Antimony:				
Ore and concentrate	6,531	3,993	--	Bolivia 2,365; Republic of South Africa 912; China 698.
Oxides	1,048	1,150	10	China 570; U.S.S.R. 240; United Kingdom 220.
Metal including alloys, all forms	2,366	2,493	--	China 2,358.
Arsenic: Oxides and acids	451	599	(2)	France 420; China 147.
Beryllium:				
Oxides and hydroxides	91	116	105	China 11.
Metal including alloys, all forms kilograms	1,968	3,037	3,037	
Chromium:				
Ore and concentrate	743,937	694,521	--	Republic of South Africa 311,929; India 126,416; U.S.S.R. 77,100.
Oxides and hydroxides	2,379	2,418	1,157	West Germany 749; U.S.S.R. 367; China 145.
Cobalt:				
Oxides and hydroxides	227	306	26	Belgium 230; Canada 24.
Metal including alloys, all forms	1,132	2,015	283	Zaire 451; Belgium 442; Republic of South Africa 359.
Columbium and tantalum:				
Ore and concentrate	1,405	2,070	--	Canada 2,050.
Metal including alloys, all forms, tantalum	19	25	20	West Germany 4.
Copper:				
Ore and concentrate thousand tons	3,338	3,628	521	Philippines 840; Canada 838; Papua New Guinea 305.
Matte and speiss including cement copper	--	478	--	Peru 350; Taiwan 110.
Sulfate	377	420	(2)	China 240; U.S.S.R. 180.
Metal including alloys:				
Scrap	51,866	56,418	24,731	Hong Kong 13,588; Taiwan 9,113; Singapore 2,877.
Unwrought	331,425	374,198	12,446	Zambia 145,285; Chile 81,441; Peru 72,995.
Semimanufactures	3,264	2,956	1,304	Republic of Korea 962; West Germany 172.
Germanium: Metal including alloys, all forms kilograms	2,546	874	(2)	China 825.
Gold:				
Ore and concentrate value	$370,844	$1,710	--	All from Papua New Guinea.
Metal including alloys, unwrought and partly wrought thousand troy ounces	5,566	4,624	7	Switzerland 1,569; United Kingdom 1,460; U.S.S.R. 1,039.
Indium: Metal including alloys, all forms kilograms	891	4,040	461	Belgium-Luxembourg 1,365; United Kingdom 814; West Germany 728.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite thousand tons	123,362	121,808	(2)	Australia 54,140; Brazil 27,346; India 15,739.
Metal:				
Scrap do	1,791	2,025	1,365	U.S.S.R. 230; Australia 226.
Pig iron, cast iron, related materials do	1,086	1,381	18	China 778; Australia 226; U.S.S.R. 155.
Ferroalloys:				
Ferrochromium	189,928	214,313	1,747	Republic of South Africa 130,307; Brazil 33,220; Zimbabwe 17,284.
Ferromanganese	6,505	11,965	--	India 6,034; Brazil 3,485; China 1,314.
Ferromolybdenum	266	374	--	Austria 240; Belgium-Luxembourg 38.
Ferronickel	26,493	29,758	--	New Caledonia 13,990; Indonesia 11,096.
Ferrosilicochromium	9,764	6,662	--	Zimbabwe 4,405; Republic of South Africa 1,168.
Ferrosilicomanganese	NA	75,627	2,415	Republic of South Africa 30,583; Brazil 24,000; China 11,871.
Ferrosilicon	196,487	237,541	53	Norway 38,687; Brazil 36,058; China 33,196.
Silicon metal	55,038	61,473	1,500	China 13,333; Brazil 7,966; Norway 7,755.
Unspecified	72,751	7,781	107	Brazil 3,046; France 1,511; China 1,166.
Steel, primary forms	725,616	934,058	556	Republic of Korea 757,484; Taiwan 78,608; Brazil 54,987.
Semimanufactures	27,723	46,812	4,337	Republic of Korea 28,061; Sweden 2,719.

See footnotes at end of table.

Table 3.—Japan: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Lead:				
Ore and concentrate	255,765	225,654	6,000	Canada 116,333; Peru 56,509; Republic of South Africa 16,207.
Oxides	2,812	1,506	2	Mexico 803; Singapore 394; China 306.
Metal including alloys:				
Scrap	2,668	2,762	1,074	United Arab Emirates 781; Australia 405; Papua New Guinea 197.
Unwrought	67,472	61,778	37	Australia 19,794; North Korea 10,719; Mexico 10,194.
Semimanufactures	390	32	26	West Germany 4.
Lithium:				
Oxides and hydroxides	631	670	362	U.S.S.R. 290.
Metal including alloys, all forms	30	35	32	West Germany 3.
Magnesium: Metal including alloys, all forms	11,274	14,369	10,359	Norway 1,866; Canada 1,266.
Manganese:				
Ore and concentrate thousand tons	2,493	2,164	--	Republic of South Africa 1,037; Australia 507; India 327.
Oxides	921	682	11	Belgium 667.
Mercury 76-pound flasks	2,016	2,359	--	Mexico 1,201; China 957.
Molybdenum:				
Ore and concentrate	16,290	17,245	6,683	Canada 6,070; Chile 3,450.
Oxides and hydroxides	660	635	602	West Germany 26.
Metal including alloys, all forms	137	209	66	West Germany 116.
Nickel:				
Ore and concentrate thousand tons	3,463	2,997	--	New Caledonia 1,433; Indonesia 1,080; Philippines 484.
Matte and speiss	36,608	40,374	--	Australia 19,571; Indonesia 19,287.
Metal including alloys:				
Scrap	2,252	2,938	1,719	Taiwan 592; United Kingdom 242.
Unwrought	17,883	21,345	2,539	Canada 4,373; U.S.S.R. 4,295; Philippines 3,035.
Semimanufactures	2,099	2,191	423	United Kingdom 1,147.
Platinum-group metals: Metals including alloys, unwrought and partly wrought:				
Palladium thousand troy ounces	951	1,048	83	U.S.S.R. 630; Republic of South Africa 210.
Platinum do.	1,210	1,099	118	Republic of South Africa 585; U.S.S.R. 196; United Kingdom 151.
Rhodium troy ounces	36,685	32,404	4,264	U.S.S.R. 16,808; Republic of South Africa 9,523.
Iridium, osmium, ruthenium do.	39,429	54,597	6,403	Republic of South Africa 34,586; United Kingdom 12,230.
Unspecified do.	17,148	20,091	3,661	West Germany 10,407; Switzerland 5,160.
Rare-earth metals including alloys, all forms	8	9	4	France 3; Brazil 2.
Selenium, elemental kilograms	7,275	2,528	--	Sweden 1,500; Peru 998.
Silicon, high-purity	35	50	8	Italy 15; West Germany 8; United Kingdom 8.
Silver: Metal including alloys, unwrought and partly wrought thousand troy ounces	14,159	16,642	436	Mexico 7,850; Peru 3,152; North Korea 2,976.
Tellurium, elemental kilograms	6,574	6,815	906	U.S.S.R. 3,000; Peru 2,863.
Tin: Metal including alloys, all forms	30,298	26,252	7	Malaysia 14,895; Indonesia 6,643; Thailand 4,269.
Titanium:				
Ore and concentrate	323,057	367,500	--	Malaysia 141,299; Australia 81,506; India 76,203.
Oxides	3,833	5,127	48	Republic of Korea 1,761; Belgium 1,025; United Kingdom 854.
Slag	66,086	91,625	--	Republic of South Africa 57,375; Canada 34,250.
Tungsten:				
Ore and concentrate	2,256	2,297	--	China 768; Republic of Korea 460; Portugal 349.
Metal including alloys, all forms	164	118	3	Republic of Korea 100.
Uranium and/or thorium:				
Ore and concentrate	41	57	(2)	China 34; Niger 23.
Oxides and other compounds kilograms	808	1,399	--	France 700; United Kingdom 352; U.S.S.R. 339.

See footnotes at end of table.

Table 3.—Japan: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Vanadium: Oxides and hydroxides	3,943	4,846	373	Republic of South Africa 3,593; China 786.
Zinc:				
Ore and concentrate	877,995	813,408	5,486	Australia 357,923; Canada 215,808; Peru 168,313.
Oxides	4,703	4,232	14	Republic of Korea 1,534; Taiwan 1,284; Singapore 700; China 473.
Metal including alloys, all forms	34,841	46,583	232	North Korea 26,848; Republic of Korea 6,978; Peru 6,134.
Zirconium:				
Ore and concentrate	157,733	196,453	13	Australia 167,513; Republic of South Africa 23,936.
Metal including alloys, all forms	60	11	3	Sweden 5; France 3.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	5,145	6,065	1,085	India 3,792; China 1,039.
Artificial: Corundum	9,653	12,271	132	China 6,212; India 3,397; Austria 700.
Dust and powder of precious and semiprecious stones other than diamond kilograms	65,270	81,002	--	West Germany 81,000.
Grinding and polishing wheels and stones	289	349	62	Austria 128; West Germany 72; Italy 51.
Asbestos, crude	237,963	229,125	11,948	Canada 95,791; Republic of South Africa 50,283; U.S.S.R. 38,204.
Barite and witherite	45,251	40,187	18	China 39,571.
Boron materials:				
Crude natural borates	37,371	28,779	--	Turkey 26,970; U.S.S.R. 1,805.
Oxides and acids	17,396	18,480	12,203	U.S.S.R. 3,652.
Bromine and iodine	2,076	3,210	477	Israel 2,541.
Clays, crude:				
Andalusite, kyanite, sillimanite	28,280	26,627	3,644	Republic of South Africa 21,759; India 1,196.
Kaolin	521,681	560,071	442,957	Republic of Korea 51,313; Brazil 34,000; China 10,258.
Unspecified	257,955	256,848	109,193	China 102,474; Republic of Korea 20,780; Republic of South Africa 17,764.
Diamond:				
Gem, not set or strung thousand carats	798	848	37	India 407; Israel 232.
Industrial do	635	757	148	Republic of South Africa 258; Zaire 91; Congo 49.
Dust and powder do	21,354	23,279	12,450	Ireland 9,801; Zaire 566.
Diatomite and other infusorial earth	9,429	8,984	8,955	Mexico 28.
Feldspar	4,981	6,114	34	China 3,576; India 1,065; Canada 884.
Fertilizer materials: Manufactured:				
Nitrogenous	29,622	39,777	4,331	Chile 20,000; Republic of Korea 4,423; North Korea 3,642.
Phosphatic	55,784	67,070	24,372	Republic of Korea 29,652; China 13,046.
Potassic thousand tons	1,209	1,300	215	Canada 629; U.S.S.R. 149; West Germany 138.
Unspecified and mixed	213,657	312,988	288,504	Republic of Korea 20,268.
Fluorspar	428,314	413,535	--	China 270,822; Republic of South Africa 69,628; Thailand 66,402.
Graphite, natural	52,697	53,138	164	China 28,998; Republic of Korea 13,602.
Gypsum and plaster	203,138	222,810	504	Australia 92,583; Mexico 74,905; Thailand 36,580.
Magnesium compounds:				
Magnesite	199,356	249,948	13	China 158,789; North Korea 89,174.
Oxides and hydroxides	755	2,175	6	China 1,931; West Germany 121.
Mica:				
Crude including splittings and waste	12,598	14,509	579	Canada 6,420; India 4,906.
Worked including agglomerated splittings	61	142	1	France 66; China 30; India 28.
Nitrates, crude	4,000	4,000	--	All from Chile.
Phosphates, crude thousand tons	2,256	2,216	1,237	Morocco 600; Jordan 236; Senegal 66.
Phosphorus, elemental	15,764	21,830	7,065	Canada 9,634; China 2,834; U.S.S.R. 2,012.
Pigments, mineral:				
Natural, crude	6,059	1,161	(2)	China 1,029; Austria 102.
Iron oxides and hydroxides, processed	5,370	6,793	2,322	West Germany 4,255.

See footnotes at end of table.

Table 3.—Japan: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Precious and semiprecious stones other than diamond:				
Natural:				
Gem material kilograms	723,860	345,604	12,322	Brazil 151,546; Angola 53,120; Madagascar 32,200.
Industrial do.	[r]122	32	--	China 26.
Synthetic do.	69,474	49,395	27,680	West Germany 13,706; France 3,955; Malaysia 1,099.
Salt and brine thousand tons	6,510	6,269	(2)	Australia 2,878; Mexico 2,873.
Sodium compounds, n.e.s.:				
Carbonate, natural and manufactured	270	315	4	Romania 140; Kenya 100; U.S.S.R. 71.
Sulfate, manufactured	305	47,837	88	China 33,528; Taiwan 9,651; Mexico 4,552.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	508,505	538,029	39,018	Republic of Korea 153,621; India 130,073; China 63,805.
Worked	73,539	73,163	88	Republic of Korea 48,026; Italy 9,862; Taiwan 5,356.
Dolomite, chiefly refractory-grade	206,832	417,782	4,227	Philippines 318,507; Republic of Korea 84,534.
Gravel and crushed rock	366,937	408,930	21	Taiwan 390,222; France 8,411; Philippines 5,916.
Limestone other than dimension	336	472	(2)	France 468.
Quartz and quartzite	105,057	85,663	328	China 34,003; India 18,527; Republic of Korea 17,529.
Sand and gravel	778,626	747,063	712	Australia 396,232; Taiwan 259,470; Malaysia 71,825.
Sulfur: Sulfuric acid kilograms	--	4,128	3,588	United Kingdom 520.
Talc, steatite, soapstone, pyrophyllite	441,604	584,281	5,119	China 465,988; Australia 56,033; North Korea 35,270.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,700	3,949	3,108	Morocco 450; French West Indies 199.
Carbon: Carbon black	10,076	8,620	5,980	Canada 874; U.S.S.R. 625; West Germany 521.
Coal:				
Anthracite	872,732	630,197	--	China 266,329; Australia 169,936; Vietnam 101,257.
Bituminous thousand tons	77,397	78,461	25,539	Australia 31,751; Canada 9,536; Republic of South Africa 5,283.
Peat including briquets and litter	13,292	11,912	--	Canada 11,594.
Petroleum:				
Crude thousand 42-gallon barrels	1,398,982	1,310,191	(2)	Saudi Arabia 517,633; Indonesia 202,431; United Arab Emirates 180,942.
Partly refined do.	20,108	14,499	--	Kuwait 7,304; Indonesia 3,747; Saudi Arabia 2,452.
Refinery products:				
Liquefied petroleum gas do.	316,866	338,694	11,112	Indonesia 108,216; Saudi Arabia 75,837; Brunei 59,781.
Gasoline do.	62,666	71,704	208	Singapore 24,646; Saudi Arabia 20,068; Kuwait 10,227.
Mineral jelly and wax do.	52	57	38	China 14.
Kerosine and jet fuel do.	9,686	9,940	1,584	Singapore 2,793; China 1,932; Virgin Islands 978.
Distillate fuel oil do.	16,920	14,769	2,476	Saudi Arabia 9,624; China 1,634; U.S.S.R. 433.
Lubricants do.	572	407	208	Republic of Korea 48; Singapore 32.
Residual fuel oil do.	52,736	50,176	7,055	Indonesia 17,842; Singapore 14,379; U.S.S.R. 3,578.
Petroleum coke do.	12,714	14,025	12,288	China 760; Canada 479; U.S.S.R. 411.

[r] Revised. NA Not available.

[1] Excludes imports under Japanese-United States Mutual Defense Agreement or for account of U.S. military forces. Table prepared by Audrey D. Wilkes.

[2] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—Japan's primary production of aluminum dropped to the lowest level since 1963. The 1983 production represented only 21% of the industry's 1.1-million-ton-per-year capacity with only five primary smelters operating. Despite a series of moves by the Government, which included exclusion of industry members from antimonoply laws, import tariff exemptions, Government-sponsored stockpiling programs, and a Government-induced rationalization of capacity program, the depressed Japanese aluminum industry failed to recover. Although domestic demand for primary aluminum increased to 1.8 million tons from 1.6 million tons in 1982, most high-cost domestic aluminum producers simply could not compete with the low-cost foreign producers. As a result, imports of primary aluminum rose to another record-high level of 1.42 million tons and provided 79% of domestic primary aluminum demand.

The decline of the Japanese primary aluminum industry during the past 4 years is shown in table 4.

Table 4.—Japan: Primary aluminum production, by company

(Metric tons)

Company	1980	1981	1982	1983	1983 (operating capacity)[1]
Mitsubishi Light Metal Industries Co. Ltd	226,997	125,872	55,590	40,116	76,000
Mitsui Aluminum Co. Ltd	132,562	103,683	100,700	101,665	144,000
Nippon Light Metal Co. Ltd	202,082	153,607	78,806	69,565	136,000
Showa Light Metal Co. Ltd	153,785	91,633	32,659	26,733	76,000
Sumikei Aluminum Industries Ltd	98,275	92,664	23,469	--	99,000
Sumitomo Aluminum Smelting Co. Ltd	277,775	203,143	59,482	17,821	181,000
Total	[2]1,091,477	770,602	350,706	255,900	712,000

[1] Capacity allotted by the Industrial Structure Council of the Ministry of International Trade and Industry.

[2] Data do not add to total shown because of independent rounding.

According to industry sources, the industry's annual operating capacity, excluding the shutdown and frozen facilities, averaged only 656,000 tons, and the utilization rate of the operating capacity was only 39% in 1983.[4] Of the five primary aluminum smelters, only Mitsui Aluminum Co. Ltd. remained competitive with the foreign supplies owing to the conversion of the energy source to coal at its Miike plant in 1980. Because of the continuing difficulties in the Japanese aluminum industry, in November 1983, a new Aluminum Industry Committee was established by MITI to conduct a medium- and long-term study on the Japanese aluminum industry.

Japan's imports of primary aluminum surged again by 9.7% and reached a record high of 1,415,124 tons. Imports of primary aluminum by the five primary smelters amounted to 638,421 tons, of which about 430,000 tons was imported from Japanese overseas aluminum smelter projects in Canada, Indonesia, New Zealand, the United States, and Venezuela duty free under a tariff quota system introduced by MITI in 1981. Of the total imports of primary aluminum, 1,282,988 tons was regular grade (99% to 99.9% purity), 12,376 tons was high grade (more than 99.9% purity), and 119,760 tons was aluminum alloy ingot. The United States, Venezuela, New Zealand, Canada, Indonesia, Australia, and Bahrain were the dominant suppliers of regular-grade aluminum while Canada, the Federal Republic of Germany, the United Arab Emirates, and Norway were the major suppliers of high-grade aluminum. The average import price of regular-grade aluminum ingot was $1,331 per ton compared with the domestic smelters' price of $1,515 per ton.

Domestic demand for primary aluminum rose by 10% to 1.8 million tons. Consumption by rolling mills increased 12% to 1.4 million tons, wire and cable increased 9% to 91,009 tons, and aluminum casting increased 5% to 87,126 tons. The increased demand in aluminum rolling was contributed mainly by expansions in manufacturing of flat-rolled products such as beverage and food cans, sheets, and foil; and in manufacturing of extruded products, such as bars, rods, sections, wire, and tubes. Japan exported only 500 tons of primary aluminum compared with 4,223 tons in 1982.

As a result of the increase in domestic

demand, the overall stocks of primary aluminum declined by 20% to 599,676 tons at yearend compared with 750,024 tons in 1982. Stocks at dealers' warehouses dropped 64% to 79,421 tons, however, stocks at fabricators' plants rose 2% to 255,826 tons. Stocks at producers' plants dropped 40% to 118,775 tons owing to additional purchase by the Government-sponsored Light Metal Stockpiling Association while the aluminum stockpile of the association increased from 82,138 tons to 145,654 tons at yearend.

In March, the New Aluminum Refining Technique Research Association was established after a reorganization of the New Aluminum Refining Research Center, which was set up in August 1982. The association, which was composed of the five major aluminum smelters, Ishikawajima-Harima Heavy Industries Co., and Kobe Steel Ltd., was to develop a cheap method of producing aluminum. The new production process to be developed reportedly will burn coal and bauxite together in a blast furnace. According to the association officials, a $2.2 million operating budget was appropriated for fiscal year 1983.

Despite Brazil's high external debts and continuing financial difficulties in the Japanese aluminum industry, construction of the 320,000-ton-per-year Albras aluminum smelter at Bancarena and an 800,000 ton-per-year Alunorte alumina plant in northern Brazil continued with $27 million funding provided by Nippon Amazon Aluminum Co. (NALCO), a Japanese consortium. However, under an escape clause of the agreement signed in April, NALCO may withdraw from the project in May 1985 and retain a 16.3% equity. Completion of the Alunorte alumina plant was rescheduled for 1987 while the phase-one construction of the 160,000-ton-per-year Albras aluminum smelter was scheduled for completion by yearend 1985 or early 1986.

Chromium.—Japan's mine production of chromium ore and concentrate dropped in 1983 to the lowest level since 1978. Japan continued to import 98% of the chromium requirements for its steel, chemical, and ceramic (refractories) industries. Because of the high energy cost, imports of chromium ore and concentrate by the ferroalloy industry decreased to 644,895 tons from 694,521 tons in 1982 while imports of ferrochromium increased to a record high of 297,533 tons from 214,313 tons in 1982. The Republic of South Africa remained the dominant supplier providing 47% of the total chromium ore imports and 65% of ferrochromium imports in 1983. Other important overseas suppliers included India, Albania, and the U.S.S.R. for chromium ore and concentrate while Brazil, Zimbabwe, and the Philippines supplied ferrochromium.

Consumption of chromium ore and concentrate by the ferroalloy industry dropped to 597,371 tons from 641,541 tons in 1982. Consumption by the chemical and ceramic industries also dropped to 45,000 tons and 35,000 tons from 50,000 tons and 41,000 tons in 1982, respectively. For the manufacturing of stainless steel, Japan consumed 533,500 tons of high-carbon ferrochromium and 36,694 tons of low-carbon ferrochromium. About 52% of the ferrochromium consumption was from overseas sources. Because of the strategic importance of ferrochromium to the Japanese specialty steel industry, a 12-day supply of high-carbon ferrochromium was stockpiled by three different rare metal stockpile programs in 1983.

Cobalt.—Production of cobalt metal dropped sharply reflecting cutbacks of raw materials from overseas and slow recovery of domestic demand, whereas imports of cobalt metal continued to increase in 1983. Because of cutbacks of mixed nickel-cobalt sulfides from the Surigao nickel mine in the Philippines and the Greenvale Mine of Australia, production of cobalt by Sumitomo Metal Mining Co. Ltd. and Nippon Mining Co. Ltd. was below 50% capacity. Imports of cobalt contained in mixed nickel-cobalt sulfides was 1,860 tons compared with 2,060 tons in 1982 and 2,610 tons in 1981 while imports of cobalt metal, powder, and flakes reached a record-high level of 1,910 tons in 1983. The major overseas suppliers were Zaire, Belgium, Finland, and the United States.

Consumption of cobalt in Japan was up slightly owing to increased consumption by manufacturers of specialty steel and ultrahard alloy. In 1983, consumption of cobalt by semimanufacturers was as follows: magnetic alloy, 406 tons; extruded products, 293 tons; specialty steel, 291 tons; ultrahard alloy, 180 tons; catalysts, 140 tons; and other, 153 tons. Consumption of cobalt by the manufacturers of magnetic alloy has dropped significantly from the 1,000-ton level in 1977-78 to the 400-ton level in 1982-83 resulting from substitution of ferrite for cobalt in production of magnets used in computers and telecommunication equipment.

Stocks of cobalt at yearend were 759 tons compared with 597 tons in 1982. In addition, a 12-day supply of cobalt metal was stockpiled by the three rare metal stockpile programs.

Copper.—Domestic mine production of copper continued to decline and reached the lowest level in 33 years, while production of refined copper increased slightly to another record high in 1983. Declining ore grade, high cost of production, and low price of the metal had resulted in the decline of the copper mining industry and had forced one of the major copper producers, Shimokowa Mining. Co. Ltd., to shut down its copper-zinc operations in north-central Hokkaido in February 1983. The average copper content of domestic crude ore and copper concentrate was 1.2% and 20%, respectively.

The share of domestic ore in overall refined copper production fell to 3.3% and the share of imported ore also fell to 83.2%; however, the share of copper scrap, waste, and copper-bearing residues rose significantly to 13.5% in 1983 from 11.8% in 1982. Imports of copper ore and concentrate dropped to 3.1 million tons from 3.6 million tons in 1982 owing to cutbacks of copper concentrate from the United States and the Philippines. To cope with strong domestic and export demand for copper, the Japanese smelters turned to scrap and residues for their raw material requirements without a substantial cutback in the industry's operating capacity. The refining industry was operating at about 88% of its 1.2-million-ton-per-year capacity.

Table 5.—Japan: Copper smelters and refineries

(Metric tons)

Company and plant location	Annual capacity	
	Smelting	Refining
Dowa Mining Co. Ltd.:		
Kosaka, Akita	52,200	60,000
Okayama, Okayama	[1]15,120	[1]8,400
Furukawa Electric Co. Ltd.:		
Nikko, Tochigi	--	48,000
Furukawa Mining Co. Ltd.:		
Ashio, Tochigi	50,400	--
Godo Shigen Sangyo Co.:		
Miyako, Iwate	36,000	--
Hibi Kyodo Smelting Co. Ltd.:		
Tamano, Okayama	164,000	102,000
Mitsubishi Metal Corp.:		
Naoshima, Kagawa	193,200	163,200
Mitsui Mining & Smelting Co. Ltd.:		
Hibi, Okayama	39,600	--
Takehara, Hiroshima	--	87,600
Nippon Mining Co. Ltd.:		
Hitachi, Ibaraki	[1]84,000	156,000
Saganoseki, Ooita	300,000	180,000
Onahama Smelting & Refining Co. Ltd.:[2]		
Onahama, Fukushima	294,000	234,000
Sumitomo Metal Mining Co. Ltd.:		
Besshi Ehime	216,000	[3]180,000
Total	1,444,520	1,219,200

[1] Shut down.

[2] A joint custom smelter of Mitsubishi Metal, Dowa Mining, Furukawa Co., Furukawa Electric, Mitsui Mining & Smelting, and Dainichi Nippon Wire and Cable Co.

[3] Refining capacity was expanded to 192,000 tons per year in July 1983.

Imports of copper concentrate were mainly from Canada, the Philippines, Papua New Guinea, Indonesia, Australia, Chile, and the United States. Imports of copper concentrate from the United States dropped to 161,531 tons from 520,728 tons in 1982 owing to the suspension of the Butte copper operation in Montana by the Anaconda Minerals Co. Imports of refined copper in cathodes totaled 190,385 tons. Zambia, Peru, and Chile remained the principal suppliers in 1983. During the year, Japan also imported 55,509 tons of blister mainly from Peru, the Republic of South Africa, and Namibia.

Domestic consumption of refined copper rose 2.9% to 1,368,555 tons, of which 938,654 tons was by electric wire and cable fabricators, 407,894 tons was by brass mills, and 22,033 tons was by casting and other. Exports of refined copper increased sharply to 177,509 tons owing to the increased purchase of refined copper by China. The overall stock of refined copper dropped 44.5% to 138,952 tons at yearend 1983 from that of

1982. Stocks held by producers were 60,465 tons; distributors, 11,320 tons; and fabricators, 67,167 tons.

In May, a Japanese consortium of eight companies led by Nippon Mining reached an accord with the Zaire Mining Development Co., the joint venture firm of the eight companies and the Zaire Government, to withdraw completely from its copper mine project in Zaire. The consortium reportedly had invested over $255 million in the Musoshi and Kinsenda Mines in Zaire since 1972. Over the past 10 years, the project incurred a total net loss of $225.5 million because of low copper prices, political instability in Zaire's neighboring countries, foreign exchange losses on the Japanese yen investment in the project owing to the depreciation of the yen, and high cost of shipping the concentrate from a South African port about 3,400 kilometers away from the mines. According to an official of the Japanese consortium, the accord called for the eight companies to sell all of their stocks to the Zaire Government for $30 million on June 10, 1983, and to provide a $20 million loan to the Government for continuing operation of the mines. The Japanese companies will continue to purchase the copper concentrate from Zaire Mining Development.[5] In August, Sumitomo Metal Mining and Nissho Iwai Australia Ltd. reportedly withdrew from their joint venture exploration of copper with C.S.R. Ltd. in the Stuart Shelf area of South Australia because of an unsuccessful preliminary drilling program.

Gold and Silver.—Mine production of gold and silver remained at about the same level as that of 1982 while metal production of both gold and silver increased in 1983. According to industry sources, the substantial increase in silver metal production was a result of an increase in production capacity. Domestic metal production of gold and silver accounted for 22.6% and 70.1% of domestic consumption, respectively. However, in production of gold and silver metal, imported ore accounted for 72% and 50%, respectively. Japan also imported 3.4 million troy ounces of gold and 13.2 million troy ounces of silver to meet the domestic demand. Switzerland, the United Kingdom, and the U.S.S.R. remained the dominant suppliers of Japan's gold imports, while Mexico, Peru, Australia, and the United States were the major suppliers of Japan's silver imports.

Domestic demand for gold fell 3% to 6.09 million troy ounces resulting from a 25% drop in private hoarding to 2.35 million troy ounces despite a 28% increase in demand for gold by electronic communications and plating to 1.38 million troy ounces. Other major consumers of gold included jewelry, watches, and fine arts totaling 1.52 million troy ounces. Exports of gold fell sharply to 154,000 troy ounces. Domestic demand for silver rose 14% to 72 million troy ounces, of which 56% was for photographic materials, 10% for electrical contact points, 9% for industrial silver nitrate, 5% for fabricated products, 5% for brazing alloys, 4% for plating, and 11% for other. Exports of silver rose sharply to 4.8 million troy ounces in 1983.

Sumitomo Metal Mining reportedly started development of the Hishikari gold project about 45 kilometers northwest of Kagoshima on Kyushu Island in early 1983. The commercial production was scheduled to begin in October 1984 and is expected to reach full-scale operation at the rate of 60,000 tons of ore per year in July 1985.

During 1983, three important gold discoveries were reported. In April, Nippon Mining discovered a gold and silver deposit in Hokkaido. A detailed survey of the deposit was scheduled to start in June. Mitsubishi Metal Corp. found a rich gold vein at its Yatani lead-zinc mine in Yamagata Prefecture. Preliminary samples indicated an average ore grade of 50 grams of gold and 220 grams of silver per ton of ore. In November, Mitsui Mining & Smelting Co. Ltd. reportedly discovered gold deposits near the Hishikari gold deposit of Sumitomo Metal Mining in Kagoshima on Kyushu Island. According to Mitsui Mining, based on 15 test borings, the deposits indicated the veins contain between 10 grams and 127.6 grams of gold per ton of ore. However, the size of the deposits remained to be determined.

Iron and Steel.—Japan's crude steel production continued to decline for the third consecutive year because of the low level of domestic demand especially in the construction sector. However, Japan remained the world's second largest iron and steel producer and its crude steel output accounted for 14.6% of total world production in 1983.

The five major integrated steel companies continued to play a significant role in crude steel production in Japan as well as in the world (table 6).[6] The combined production of the five companies accounted for 66.9% and 9.8% of Japan's and the world's total steel production, respectively.

Table 6.—Japan: Crude steel production and world rank of the five major companies

Company	Output (million metric tons) 1982	Output (million metric tons) 1983	World rank 1982	World rank 1983
Nippon Steel Corp	28.32	26.86	1	1
Nippon Kokan K.K	11.99	11.41	3	5
Kawasaki Steel Corp	10.86	10.36	8	6
Sumitomo Metal Industries Ltd	10.88	10.34	7	7
Kobe Steel Ltd	6.43	6.06	16	17
Total	68.48	65.03	XX	XX

XX Not applicable.

In 1983, the output of pig iron represented only 53.2% of the 137-million-ton-per-year capacity, and over 99.8% of the output was produced by blast furnaces. The output of crude steel represented only 62.2% of the 156-million-ton-per-year capacity and about 72% of the output was produced by basic oxygen furnaces and 28% by ultrahigh-power electric furnaces. In crude steel processing, four new continuous-casting machines were added. By yearend, there were 156 continuous-casting machines operating with an annual capacity of 83.2 million tons. The percentage of continuous-casting processing of all rolled steel increased from 78.7% to 86.3% in 1983 while the percentage for rolled ordinary steel and rolled specialty steel was 90.4% and 66%, respectively.

Although progress was being made in the areas of efficiency and new high-quality products, Japan's iron and steel industry continued to face the long-term structural problems of excess production capacity and the low level of capacity utilization because of the stagnant domestic steel demand and the increased imports of carbon steel products from the Republic of Korea and Taiwan. As a result, about 40% of the existing blast furnaces were being shut down, and extensive retraining programs supported by the Government were being undertaken by major steelmakers. To cope with the industry's structural problems and to streamline their overall operations, several major steel producers reportedly diversified into the chemical, new industrial materials, and other nonsteel sectors. Sumitomo Metal Mining, for example, planned to increase sales of its new business to 20% of overall sales by getting into production of silicon and ceramics for the electronics industry, into carbon fibers and other coal-tar derivatives for the coal-chemical industry, and into new metals including titanium-nickel alloy and powder metallurgy products. Nippon Kokan K.K. reportedly had diversified into the sports business and planned to raise its 30% of nonsteel sales to 40%. Nippon Steel Corp. and Kawasaki Steel Corp. were branching out into other industrial materials (titanium alloy) and engineering services for construction of large steel mills overseas especially in Brazil and China.[7]

The financial performance of the major steelmakers was mixed in fiscal year 1983. Nippon Steel reversed last year's loss of $41 million to a profit of $8.4 million, and Kawasaki Steel was expected to make a profit of $4.2 million. On the contrary, Kobe Steel was expected to suffer a loss of $29.5 million compared with a profit of $48 million in fiscal year 1982. Nippon Kokan and Sumitomo Metal Mining reportedly suffered heavily from the depressed shipbuilding and pipe markets. Both companies were expected to record a loss of about $55 million each in fiscal year 1983.

Domestic mine production of iron and pyrite concentrate continued to decline and remained insignificant for consumption of iron ore and iron sand by the iron and steel industry. To meet the raw material requirements during 1983, Japan imported 109.2 million tons of iron ore, iron sand, iron sinters, pellets, and briquets mainly from Australia, 45.6%; Brazil, 21.5%; India, 13.4%; the Republic of South Africa, 4.7%; Chile, 4.6%; and other, 10.2%. Japan also imported 54.2 million tons of coking coal principally from Australia, 46.6%; the United States, 26.1%; Canada, 17.6%; and other, 9.7%.

The iron and steel industry consumed 91.7 million tons of iron ore, 9.5 million tons of pellets, 2.2 million tons of iron sand, 40.2 million tons of iron and steel scrap, 702,000 tons of ferruginous manganese ore, 49.3 million tons of coking coal, 9.6 million tons of other iron-bearing materials, 976,000 tons of manganese ore, and 12.9 million tons of limestone. Consumption of energy by the industry included 12,271,000 barrels of fuel oil, 58.6 billion kilowatt hours of electricity, 40.9 million tons of coke, and 4.9 billion cubic meters of oxygen. The industry employed about 270,000 workers, of whom 189,300 were production workers. The production worker worked 167 hours per month and earned an average hourly wage of $7.03 compared with $6.53 in 1982.

Because of the slump in the construction and industrial machinery sectors, estimated apparent consumption of crude steel dropped to about 65.5 million tons compared with 69.5 million tons in 1982. Domestic orders for ordinary and specialty steel products by end use are shown in table 7.

Table 7.—Japan: Domestic orders for ordinary and specialty steel products, by end use

(Thousand mtric tons)

End use	Ordinary		Specialty	
	1982	1983	1982	1983
Automobiles	8,491	8,575	1,420	1,607
Construction	12,834	11,647	504	447
Conversion and processing	2,950	2,741	2,795	3,045
Electric machinery	2,279	2,254	72	68
Home and office equipment	785	651	173	173
Industrial machinery	1,861	1,441	985	909
Rolling stock	174	153	36	55
Shipbuilding	3,218	2,929	62	70
Steel dealers	13,823	13,605	837	875
Tanks and containers	1,832	1,826	68	99
Other	303	307	81	62
Total	48,550	46,129	7,033	7,410

Exports of iron and steel products increased from 29.5 million tons to 32 million tons in 1983, of which 28.2 million tons was ordinary steel products, 2 million tons was specialty steel products, 988,000 tons was steel wire products, and 851,000 tons was pig iron, ferroalloy steel ingots, semimanufactured steel products, and other steel products. Exports of iron and steel products were mainly to China, 7.2 million tons, a 147% increase over those of 1982; the United States, 4.6 million tons; Saudi Arabia, 2.4 million tons; the U.S.S.R., 2 million tons; the Republic of Korea, 1.9 million tons; Singapore, 1.4 million tons; Iran, 1.2 million tons; Indonesia, 1.2 million tons; and Taiwan, 1.1 million tons. Despite an 8.5% increase in export volume of iron and steel products and a slight appreciation of the Japanese yen, export earnings dropped 17.9% to $12.8 billion owing to a 24% cut in average export price for all steel products to $407 per ton.

Imports of iron and steel products rose again by 13.1% to 4.5 million tons, of which 1 million tons was pig iron, 753,000 tons was ferroalloys, 2.6 million tons was ordinary steel products, and 147,000 tons was semimanufactured steel products and other steel products. The most significant increase in steel imports was in ordinary steels, which rose 38%. The Republic of Korea, Taiwan, and Brazil alone accounted for 60% of the imports. The mounting imports of cheap foreign steel products reportedly made it difficult for Japanese steel producers to raise their domestic prices while forcing many producers to shut down marginal facilities and cut back their steel production.

Lead and Zinc.—Mine production of lead and zinc both increased slightly. Despite the general decline in the Japanese nonferrous mining industry, the lead and zinc mining sector remained steady. According to the 1983 MITI survey, the top six domestic lead and zinc mining companies and their 1982 output were as follows, in tons of metal content:

Company and mine location	Mine production	
	Lead	Zinc
Dowa Mining Co. Ltd.:		
Kosaka, Akita	5,873	21,843
Hanaoka, Akita	9,685	48,161
Hosokura Mining Co. Ltd.:		
Hosokura, Miyagi	5,289	15,771
Mitsui Mining & Smelting Co. Ltd.:		
Kamioka, Gifu	4,865	62,612
Nippon Zinc Mining Co. Ltd.:		
Nakatatsu, Fukui	1,314	20,907
Syakanai Mining Co. Ltd.:		
Syakanai, Akita	3,531	18,311
Toyoha Mining Co. Ltd.:		
Toyoha, Hokkaido	8,509	34,737
Other	6,807	29,014
Total	45,873	251,356

The combined output of the top six producers accounted for 85.2% and 88.5% of total lead and zinc mine production in 1982. Other important lead and zinc producers included Hokushin Mining Co. Ltd. at Ooe, Hokkaido; Chuugai Mining Co. Ltd. at Jokoku, Hokkaido; Hanawa Mining Co. Ltd. at Hanawa, Akita; Furutobe Mining Co. Ltd. at Minami Furutobe, Akita; Yatani Mining Co. Ltd. at Yatani, Yamagata; and Akenobe Mining Co. Ltd. at Akenobe, Hyogo.

Because of a strong recovery in domestic demand for lead and zinc, Japan imported 5.4% more lead ore and concentrate—237,807 tons in 1983. Peru, Canada, Australia, and the Republic of South Africa were the major suppliers. However, imports of zinc ore and concentrate dropped slightly to 759,924 tons. Australia, Peru, and Canada remained the major suppliers. Imports of zinc concentrate from Canada dropped significantly owing to the closure of the Pine Point Mine operated by Cominco Ltd. of Canada.

Production of refined lead and zinc both increased owing to improvements in domestic and exports markets. The lead refining industry was operating at 80% of its 300,000-ton-per-year capacity while zinc refining was operating at 69% of its 1,019,640-ton-per-year capacity. To meet the domestic demand for refined lead and zinc, Japan imported 49,121 tons of refined lead principally from Australia and 41,246 tons of refined zinc mainly from North Korea and Peru.

Domestic demand for primary lead increased 2.3% to 260,234 tons as a result of a 9.5% increase in demand from storage batteries and a steady growth in demand from the inorganic chemicals. Exports of refined lead jumped 94.3% to 14,429 tons. Demand for primary zinc also increased 4.1% to 719,210 tons owing to a 10.7% increase in demand from galvanized steel sheet for automobiles and recovery of zinc demand in die casting and brass mills. Exports of refined zinc also rose 20.7% to 49,217 tons. The Republic of Korea, North Korea, Taiwan, the Philippines, and Singapore were the major buyers of Japanese refined lead while Taiwan, China, the Philippines, the Republic of Korea, and Indonesia were the principal buyers of Japanese refined zinc.

By yearend, the overall stocks of primary lead dropped 34.5% to 22,501 tons, of which 7,434 tons was held by producers, 1,513 tons by distributors, and 13,553 tons by lead consuming manufacturers. The overall stocks of primary zinc dropped 45.3% to 93,757 tons, of which 54,990 tons was at producers' plants, 3,055 tons was held by distributors, 31,743 tons by zinc consuming manufacturers, and 3,969 tons was held by the Metallic Mineral Stockpiling Association, which sold back 56,934 tons of primary zinc to producers as a result of rising demand. According to industry sources, the association planned to abolish the stockpile of primary zinc by the end of March 1984.

Manganese.—Domestic mine production continued to decrease because of the reduction in output at the Ooe Mine, operated by Hokushin Mining, and the Jokoku Mine, operated by Chuugai Mining, both in Hokkaido. To meet the domestic demand for manganese, Japan imported 10,233 tons of manganese dioxide ore and concentrate from Gabon and China and 1,020,353 tons of metallurgical-grade manganese ore and concentrate mainly from the Republic of South Africa, 45.3%; and Australia, 39.2%. Japan also imported 592,658 tons of ferruginous manganese ore and concentrate mainly from the Republic of South Africa and India.

Consumption of manganese ore and concentrate by the iron and steel industry totaled 976,265 tons, of which 10,923 tons was domestic ore and 965,342 tons was imported ore. Consumption by other industries such as the manufacture of electrolytic manganese metal, batteries, ceramics, and chemicals totaled 60,628 tons, of which 32,798 tons was domestic ore and 27,830 tons was imported ore. Consumption of ferruginous manganese ore and concentrate by the iron and steel industry, mainly for production of sinter and pig iron, totaled 702,000 tons.

By yearend, the stocks of manganese ore and concentrate were 552,003 tons compared with 651,554 tons in 1982. The stocks of ferruginous manganese ore and concentrate were 701,692 tons compared with 867,610 tons in 1982. Because of the strategic importance of manganese to the Japanese iron and steel industry, a 12-day supply in the form of ferromanganese was stockpiled by the three rare metal stockpile programs in 1983.

Molybdenum.—Mine production of molybdenum remained at the same level as that of 1982. The Higashiyama Mine operated by Taenaka Mining Co. Ltd. in Shimane Prefecture was the only producing mine in Japan. According to the industry sources, Taiyo Mining and Industrial Co. started production of molybdenum from the recycling facility at its Akaho plant in Hyogo Prefecture in March.[8] The 1983 planned production was 400 tons of molybdenum trioxide. However, most of Japan's requirements for molybdenum were met by imports. Imports of molybdenum concentrate totaled 18,737 tons mainly from Chile, the United States, and Canada.

Consumption of molybdenum ore and concentrate totaled 9,347 tons, of which 7,023 tons was by the ferroalloy industry, 449 tons was by manufacturers of molybdenum metal, 927 tons was by inorganic chemicals, and 948 tons was by other industries.

By yearend, the overall stocks of molybdenum ore and concentrate totaled 1,183 tons, of which 61 tons was held by ore producers, 222 tons was by dealers, and 900 tons was by ore consumers. Because of the strategic importance of molybdenum to the Japanese specialty steel industry, a 12-day supply in the form of molybdenum concentrate was stockpiled by the three rare metal stockpile programs.

Nickel.—The overall picture of Japan's nickel industry was mixed. Production of nickel metal by Nippon Mining and Sumitomo Metal Mining improved slightly from that of 1982, while production of ferronickel suffered a substantial cutback owing to a sharp increase in imports of cheaper foreign ferronickel. For production of refined nickel, Japan imported 37,982 tons of nickel matte containing 28,860 tons of nickel metal from Indonesia and Australia, and 12,180 tons of nickel-cobalt mixed sulfide containing 3,434 tons of nickel metal from Australia and the Philippines. To meet the domestic demand for refined nickel, Japan also imported 26,822 tons of nickel metal mainly from Canada, the U.S.S.R., the Philippines, Australia, Zimbabwe, Norway, and the United States, and 3,362 tons of nickel foil powder and flakes principally from the Philippines, the United Kingdom, the United States, and Canada.

Domestic demand for refined nickel rose 21% to 39,601 tons from that of 1982. Consumption of nickel by the specialty steel industry increased 34.7% to 20,565 tons and accounted for 52% of domestic demand. Consumption of nickel by other industries was at a higher level than in 1982. These industries included galvanized sheet, 15.4%; nonferrous alloys, 13.2%; magnetic materials, 7%; storage batteries, 3.8%; rolled sheets, 3%; and other, 5.2%. Japan exported 285 tons of nickel metal mainly to Taiwan and Indonesia.

Production of ferronickel by the ferroalloy industry dropped sharply owing to reduced domestic demand and increased imports of ferronickel. As a result, most Japanese ferronickel smelters reportedly were operating at about 50% capacity. For production of ferronickel, Japan imported 2.3 million tons of nickel ore containing 39,400 tons of nickel from New Caledonia, Indonesia, and the Philippines. The 23% drop in the 1983 imports of nickel ore was an indirect result of the 23.5% increase in imports of ferronickel owing to higher energy cost in Japan. Japan imported 36,750 tons of ferronickel containing about 10,100 tons of nickel from New Caledonia, Indonesia, Dominica, and Colombia. Consumption of nickel ore by the ferroalloy industry dropped to 1.8 million tons from 2.3 million tons in 1982. Consumption of ferronickel by the specialty steel industry also declined to 211,500 tons from 230,800 tons in 1982 resulting from increasing use of refined nickel in the manufacture of stainless steel. Japan exported 13,369 tons of ferronickel mainly to the Netherlands and the United States.

By yearend, the stocks of refined nickel were 16,549 tons, of which 3,666 tons was held by nickel producers; 1,800 tons, by dealers; and 11,083 tons, by refined nickel consumers. The stocks of ferronickel held by the ferroalloy producers and specialty steel producers totaled 80,135 tons at yearend compared with 81,181 tons in 1982. A 12-day supply in the form of nickel metal, ferronickel, and nickel oxide sinter was stockpiled by the three rare metal stockpile programs.

Titanium.—Production of titanium

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sponge metal dropped sharply again in 1983 to the lowest level since 1978. The output level represented only 33% of the industry's 32,400-ton-per-year capacity. The industry suffered not only from a stagnant export market in the United States and Europe but also from a sharp drop in domestic demand from the manufacture of titanium alloys. As a result, the industry's stocks of sponge metal rose 15.7% to 5,504 tons at yearend.

According to an industry source, the total shipments of sponge metal dropped to about 9,800 tons from 14,100 tons in 1982. Exports declined to 2,112 tons from 3,486 tons in 1982 while domestic shipments including internal plant consumption dropped to 7,600 tons from 10,614 tons in 1982. Most sponge metal consumption in Japan was for the manufacture of titanium mill products such as titanium ingot and titanium alloys for aircraft industry and nonaerospace industrial uses. Over the past 5 years, a substantial growth was reported in industrial applications of titanium in the manufacture of equipment for chemical processing, petroleum refining, and power generation. Japan's titanium processing industry in 1983 was composed of ingot producers and titanium mill processors. The ingot makers included Kobe Steel, Toho Titanium Co. Ltd., Nippon Stainless Steel Co. Ltd., Kanto Special Steel Works, Nippon Mining Co. Ltd., and Osaka Titanium Co. Ltd. The titanium mill producers included Kobe Steel, Nippon Mining, Sumitomo Metal Mining, Nippon Stainless Steel, Daido Steel Co. Ltd., Furukawa Electric Co. Ltd., Hitachi Metal Co. Ltd., and Sumitomo Light Metal Co. Ltd. To meet the growing demand for titanium mill products by industrial users, Nippon Steel Corp., Kobe Steel, and Sumitomo Metal Industries Co. Ltd. reportedly were preparing to become the major titanium processors.[9]

Despite the difficult situations in Japan's titanium industry, Showa Titanium Co. Ltd., a joint venture firm of Showa Denko K.K. and Ishizuka Research Institute Ltd., completed its plant in Toyama Prefecture by yearend and is expected to produce titanium sponge in 1984 with an annual capacity of 2,000 tons per year. The company claimed its new technology can reduce the power cost to between 15,000 kilowatt hours and 18,000 kilowatt hours per ton of sponge metal produced. A contract was signed between Showa Titanium and the Associated Minerals Consolidated Ltd. of Australia in 1983 for the Australian firm to supply 5,000 tons of rutile to Showa Titanium during 1984.

During 1983, Japan imported 411,047 tons of rutile and ilmenite for the production of titanium sponge and titanium dioxide. Most rutile for sponge production was from Australia, Canada, and Sri Lanka. Most ilmenite for production of titanium dioxide was from Malaysia and India.

Tungsten.—Mine production of tungsten ore and concentrate continued to decline because of the low tungsten price and declining ore grade. Kaneuchi Mining Co. Ltd. shut down its Kaneuchi Mine in Kyoto Prefecture in September 1982. Awamura Mining Co. Ltd. closed down its Ootani Mine in Kyoto Prefecture and went out of business in September 1983. These two mines had a combined output of about 300 tons of concentrate in 1982. Most ore produced by Awamura Mining was of scheelite. In 1983, the output of tungsten concentrate represented only about 21% of Japan's tungsten requirements. Japan imported 3,214 tons of tungsten ore and concentrate principally from China, the Republic of Korea, Portugal, Peru, and Bolivia. Most imported ore and concentrate contained 65% tungsten trioxide (WO_3) or more; however, about 85% of tungsten concentrate imported from China was of low grade between 25% to 30% WO_3.

Consumption of tungsten concentrate rose to 3,409 tons from 3,289 tons in 1982. About 73.2% was consumed by manufacturers of tungsten metal; 25.8%, by manufacturers of calcium tungsten and ferrotungsten; and 1%, by other. At yearend, the stocks held by ore producers was 57 tons; dealers, 20 tons; and consumers of the concentrate, 897 tons. A 12-day supply in the form of tungsten concentrate was stockpiled by the three rare metal stockpile programs.

Vanadium.—Production of vanadium pentoxide (V_2O_5) was by Taiyo Mining at its Akaho plant in Hyogo Prefecture and Shinko Chemical Co. Ltd. at its Saki plant in Osaka Prefecture. Taiyo Mining started production by recovering V_2O_5 from spent catalysts in 1978, and Shinko Chemical started production of recovering V_2O_5 from boiler ashes in 1961. According to industry sources, production of V_2O_5 and output capacity by the two companies in 1981-83 were as follows, in metric tons:[10]

Company	1981	1982	1983[e]	1983 capacity
Shinko Chemical Co. Ltd	730	740	760	1,000
Taiyo Mining & Industrial Co. Ltd	382	482	500	600
Total	1,112	1,222	1,260	1,600

[e]Estimated.

The total output of V_2O_5 in 1983 was about 20% of the consumption by the Japanese ferroalloy industry. To meet the requirements for production for ferrovanadium and vanadium metal, Japan imported 2,958 tons of V_2O_5 from the Republic of South Africa, China, the United States, and the Federal Republic of Germany. In Japan, vanadium metal was for the manufacture of equipment used in nuclear powerplants, the electronic industry, and of super conductor material. The consumption of ferrovanadium dropped 30% to 3,560 tons. Most ferrovanadium was for the manufacture of tool steel and high-strength specialty steel. Japan also imported 741 tons of ferrovanadium principally from Austria and the Federal Republic of Germany. Because of its strategic importance to Japan's specialty steel industry, a 12-day supply in the form of ferrovanadium was stockpiled by the three rare metal stockpile programs.

NONMETALS

Cement.—Japan's cement production remained at the same level as that of 1982. Despite the continuing improvements in productivity, technology of energy efficiency, and in export markets, the cement industry remained stagnant and depressed mainly because of a weak domestic market caused by cutbacks in public works projects and slowdown in private investments in plants and equipment especially in the housing sector. According to an industry source, because of the excess capacity, competition among producers became very keen. As a result, the cement price was lower and the profitability of cement producers was reduced substantially.

In an effort to combat the industry's structural recession, several studies on restructuring the cement marketing system were undertaken by the Cement Association of Japan. A proposal was being considered to regroup the existing 23 cement companies into 3 or 5 marketing companies for distribution of cement in the domestic and export markets to reduce transportation cost and unnecessary competition, as well as to avoid further price wars among producers. The cement price in the domestic market was about $61 per ton.

There were 23 companies that operated 57 plants, of which 13 plants had capacities of 4 million tons per year; 11 plants, 2 to 3 million tons per year; 19 plants, 1 to 2 million tons per year; and 14 plants, less than 1 million tons per year. About 30 plants are located near the coastline. The cement industry has a combined capacity of 113 million tons per year with 200 tanker fleets, 4,000 private railcars, 7,000 trucks, 600 distribution terminals (372 terminals are located near the coastline), and employment of about 11,400.[11]

In 1983, the industry was operating between 60% and 70% capacity. According to a recent study conducted by the industry's association, the breakdown of cost elements was as follows: raw material, 14.6%; labor, 5.5%; fuel (coal), 17.5%; electric power, 12.9%; supplies and expenses, 10.5%; general administration, 15.5%; and direct distribution expenses, 23.5%. As a result of declining domestic demand and price competition, 15 out of 23 companies incurred losses, and the industry's overall profit to sales ratio dropped from a positive 9.6% in 1978 to a negative 3.1%.

According to the association, Japan ranked second in labor productivity in cement production in the world. Based on a recent comparative study in labor productivity of the world's cement production, the Republic of Korea became the world's most efficient cement producer owing to its new facilities and more modern equipment.

Fertilizer Materials.—Production of nitrogen fertilizers continued to decline. The output of ammonia and urea dropped to 1.9 million tons and 1 million tons, respectively, mainly because of substantial reduction in exports to China. To aid the structurally depressed chemical fertilizer industry to balance its supply and demand, the so-called Extraordinary Measure Law was extended by the Government to the producers of ammonia, urea, wet-process phosphoric acid, fused magnesium phosphate and compound fertilizer for further structural reform in June 1983. The new law allows the ammonia and urea producers to cut back their capacity further from the 1982 level by 20% for ammonia and by 30% for urea until mid-1988.

Japan's supply and demand for ammonium sulfate, urea, and ammonium chloride, according to the Japan Urea and Ammonium Sulfate Industry Association, are shown in table 8.

For production of compound fertilizers, Japan continued to import 2.4 million tons of phosphate rock principally from the United States, 60%; Morocco, 25%; and Jordan, 9%. Imports of potash fertilizer materials included 1.1 million tons of potassium chloride mainly from Canada and the

U.S.S.R. and 223,754 tons of potassium sulfate principally from the Federal Republic of Germany, Belgium, and France. Estimates of Japan's supply and demand for superphosphate and high-analysis compound fertilizers, according to Japan Phosphatic and Compound Fertilizers Association, are shown in table 9.

Table 8.—Japan: Supply and demand for ammonium sulfate, urea, and ammonium chloride

(Thousand metric tons)

	Ammonium sulfate		Urea		Ammonium chloride	
	FY 1982	FY 1983	FY 1982	FY 1983	FY 1982	FY 1983
Stocks, beginning	283	345	302	200	63	64
Production	1,767	1,666	1,311	1,093	482	416
Domestic demand:						
Fertilizer	1,098	1,176	278	285	222	244
Industrial use	33	46	525	557	18	21
Exports	574	579	610	301	241	177
Stocks, ending	345	210	200	150	64	38

Table 9.—Japan: Supply and demand for superphosphate and high-analysis compound fertilizers

(Thousand metric tons)

	Superphosphate		High-analysis compound fertilizers	
	FY 1982	FY 1983	FY 1982	FY 1983
Stocks, beginning	66	61	584	464
Production	462	478	2,491	2,576
Shipments	462	470	2,491	2,460
Exports	5	5	120	120
Stocks, ending	61	64	464	460

In May, two major phosphate rock purchase agreements were signed by Zen-Noh Phosphate Corp. (ZNPC) of Japan with two U.S. producers. The first agreement provided ZNPC with the joint mining right to mine and import annually 460,000 tons of processed phosphate rock from the Fort Watson Mine of Estech General Chemicals Inc. in central Florida. The second agreement also provided ZNPC with the mineral right to mine and import annually 300,000 tons of phosphate rock from International Minerals & Chemical Corp.'s mine at Kingsford in Florida for a minimum of 13 years.[12]

Fluorspar.—Japan is a major world consumer of fluorspar, accounting for about 7% of the world's consumption. All of Japan's fluorspar requirements were met by imports. Imports of fluorspar were about 435,000 tons. China, Thailand, Mexico, and the Republic of South Africa were the major suppliers.

Consumption of fluorspar dropped to about 408,000 tons from 440,000 tons in 1979 because of a reduction in consumption by the iron and steel industry. However, consumption of fluorspar for production of fluorine compounds had grown considerably over the past 5 years. In 1983, consumption of fluorspar by the iron and steel industry as a fluxing material to remove impurities in oxygen converter steel smelting was about 193,000 tons. Consumption by manufacturers of fluorine compounds was 142,000 tons, consumption by aluminum smelters was about 53,000 tons, and consumption by other industries was about 20,000 tons.

The metallurgical-grade fluorspar consumed by the iron and steel industry containing 75% to 85% calcium fluoride (CaF_2) was supplied mainly by China and Thailand while the acid-grade fluorspar consumed by the manufacturers of fluorine compounds and aluminum containing 97% to 98% CaF_2 was supplied by the Republic of South Africa and Mexico. Production of fluorine compounds, mainly the hydrogen fluoride for fluorocarbon gas and metal surface treatment, was estimated at 132,200 tons in 1983.

Gypsum.—Since 1978, production was mostly from byproduct gypsum plants at major nonferrous smelting complexes and other chemical fertilizer processing facilities. The estimated supply and demand for gypsum in Japan, according to a report published by MITI, are shown in table 10.[13]

Table 10.—Japan: Estimated supply and demand for gypsum

(Thousand metric tons of $CaSO_4 \cdot 2H_2O$)

	1983	1984	1985	1986
SUPPLY				
Byproduct production:				
Phosphoric and desulfurization	4,480	4,645	4,840	4,920
Titanium	425	445	455	455
Hydrofluoric acid	445	480	490	500
Mineral water refining	265	250	250	250
Other	230	230	230	230
Imports	400	350	300	300
Total	6,245	6,400	6,565	6,655
DEMAND				
Cement	2,595	2,585	2,600	2,600
Wall board	2,520	2,685	2,855	3,040
Plaster	265	260	250	245
Calcined gypsum	115	120	125	130
Other	230	230	230	230
Exports	220	160	160	160
Total	5,945	6,040	6,220	6,405

At yearend, the stocks of gypsum were about 722,000 tons, which was estimated to increase to 843,000 tons by yearend 1984. During 1983, Japan imported about 202,000 tons of natural gypsum principally from Mexico and Australia.

Limestone.—Japan's production of limestone increased slightly from that of 1982. However, the limestone mining activity remained stagnant because of the depressed cement industry, which consumed over 50% of the total limestone output in Japan. According to the Institute of Limestone Quarry of Japan, the employment of Japan's limestone industry dropped 29% to 97,000 in 1983 from that of 1970, while the labor productivity had increased 2.3 times in the past 13 years. In 1983, there were about 310 operating mines, of which 62 mines produced over 500,000 tons of limestone per year each. The combined output of these major mines accounted for more than 85% of the total production. About 50% of these major mines are located near the coastline.

Consumption of limestone was mainly by the cement industry, 55%; the construction industry, 22%; the iron and steel industry, 12%; quicklime, 6%; and other industries including filler, fertilizer, and other including soda and glass, 5%. According to the institute, 25% of the limestone was transported by ship to major cement plants and iron and steel works located near the coast, 22% by truck, 12% by railway, and the remaining 41% was consumed by the cement plants adjacent to the minesite. To reduce the cost of transportation, delivery of limestone by long-distance belt conveyor and by ship has emerged as important modes of transportation since 1980.

Environmental issues such as vibration, noise, air pollution, and waste mine water imposed serious problems to the industry. The industry was undertaking various studies and preventive measures to solve the problems. According to an official statement of the institute, a significant improvement was being made in mine safety in terms of the number of injury accidents and the accident rate per working hour.

According to the Agency of Natural Resources and Energy of Japan, the total limestone ore reserves were estimated at 57.1 billion tons, of which about 10 billion tons were proven and recoverable. Most limestone ore deposits owned and operated by the limestone quarries have an ore grade of 98% calcium carbonate.

Sulfur.—Production of sulfur rose slightly. Domestic demand was mainly by sulfuric acid manufacturers. Production of sulfuric acid was about 6.6 million tons. Domestic consumption of sulfuric acid was mainly for fertilizer and industrial uses. According to the Sulfuric Acid Association of Japan, the supply and demand situation of sulfur and sulfuric acid for fiscal year 1983 was as follows, in thousand metric tons:

Sulfur:	
Production	1,102
Demand:	
Sulfuric acid	383
Other	449
Exports	246
Sulfuric acid:	
Production:	
Smelter gas	3,878
Pyrite	674
Sulfur	1,728
Other	303
Demand:	
Industrial use	4,024
Fertilizer	2,025
Exports	560

Most exports of sulfur went to the Republic of Korea while exports of sulfuric acid were mainly to Mexico, the Republic of Korea, China, and Namibia.

MINERAL FUELS

Coal.—Japan's coal mine production continued to decline. The Yubari Mine in Hokkaido remained shut down with no hope in sight to be reopened. The overall domestic demand dropped 4% to 93 million tons because of reduced coal demand in the iron and steel and the cement industries. As a result, coal imports also dropped by 4.3% to 75.1 million tons.

There were about 28 coal mines operated by seven major coal companies mainly in Hokkaido, Kyushu, and Honshu. Of the 17 million tons of coal produced, 70% was steam coal, 29.9% was coking coal, and 0.1% was anthracite. The average heating value of domestic coal was 6,320 kilocalories per kilogram. The number of coal miners at yearend decreased by another 4.7% to 15,571 from that of 1982, while labor productivity continued to increase from 84.6 tons (revised) per month of coal per miner in 1982 to 88.8 tons per month of coal per miner in 1983. The average monthly wage of Japanese coal miners was $1,252 at yearend compared with $1,171 at yearend 1982.

The Yubari Mine operated by Hokutan Yubari Coal Mining Co. Ltd. in the Yubari City of Hokkaido has been closed since October 1981 because of a major accident that killed 93 miners and left about 2,000 miners without jobs. Over the past 2 years, various feasibility studies for reopening and redevelopment of the mine were conducted by MITI and the Japan Coal Association. However, a final decision was made by MITI not to reopen the mine in July for safety and economic reasons. The Yubari Mine was opened in 1975 with a $140 million investment by the Government of Japan for the mine construction. The output capacity of the mine was 1.5 million tons per year. By the time of the accident, the mine reportedly had a total debt of about $332 million.[14]

In 1983, domestic coal provided about 19% of the total domestic coal demand; the remaining 81% was met by imports. Japan imported 75.1 million tons of coal, of which 59.6 million tons was coking coal, 14.7 million tons was steam coal, and 820,000 tons was anthracite. The principal suppliers of coking coal were Australia, 28.2 million tons; the United States, 14.8 million tons; Canada, 10.4 million tons; and the Republic of South Africa, 3.1 million tons. The major suppliers of steam coal were Australia, 7.7 million tons; the Republic of South Africa, 2.6 million tons; China, 2.1 million tons; and the United States, 912,000 tons. Imports of anthracite were mainly from the Republic of South Africa, China, and Vietnam. Imports of coking coal dropped 7% because of an 8% decline in consumption by the iron and steel industry, while imports of steam coal jumped 6.4% because of a 20% increase in consumption by the utility industry. The average import price of coking coal at $67.74 per ton was 13% lower than that of 1982 while the average import price of steam coal at $55.52 per ton was 18.6% lower than that of 1982. The average prices of Australian coking and steam coal were $63.30 per ton and $55.93 per ton, respectively.

Table 11.—Japan: Coal consumption, by sector

(Thousand metric tons)

Sector	1982	1983
Manufacturing:		
Coke:		
Domestic	941	900
Imported	3,389	3,652
Iron and steel:		
Domestic	2,979	2,778
Imported	59,700	54,968
Cement, ceramics, other:		
Domestic	2,718	2,485
Imported	10,192	8,686
Utilities:		
Electric power:		
Domestic	9,518	9,867
Imported	4,481	7,000
Gas:		
Domestic	548	454
Imported	877	808
Other:		
Domestic	1,526	1,373
Imported	10	35
Total demand	96,879	93,006
Of which:		
Domestic	18,230	17,857
Imported	78,649	75,149

The Japan Coal Development Co. (JCDC), a consortium of Japanese electric utilities that was established in 1980 to develop and import coal, reportedly has scaled down its operations resulting from delays in construction of many coal-fired powerplants in Japan. However, JCDC will continue to participate in the ongoing Blairthol coal development project in Australia, the existing transport system for importing steam coal from northeast China, the construction project of coal loading facilities at the port of New Castle in Australia, and the construction of a coal distribution center in Hokkaido.[15]

After 4 years of negotiations, Mitsui Mining and the Government of China signed a joint venture agreement to develop a steam coal mine, the Sitaigon Mine near Taiyuan in Shanxi Province of China, in April. Under the agreement, Mitsui Mining is expected to invest $100 million and provide technical assistance. The project will be financed by the Export-Import Bank of Japan. According to the plan, the mine will start production of coal with an annual capacity of 1 million tons using the longwall mining method. The coal will be exported to Japan starting in 1987.

Petroleum and Natural Gas.—Japan remained a major world consumer and importer of petroleum and liquefied natural gas (LNG). Japan's import reliance of crude oil was still at 99.7%, despite the continuing decline in imports on crude oil by another 3.2% to 1.3 billion barrels in 1983. On the other hand, imports of LNG continued to surge with more imports coming from Sarawak of Malaysia. Domestic production of crude oil and natural gas increased slightly but remained insignificant compared with Japan's requirements for crude oil and natural gas. Consumption of crude oil by refineries dropped again by 3.5% to 1,188 million barrels; the decline was due to a decrease in the production of heavy fuel oil, especially the type "C" fuel oil consumed by utility and manufacturing industries. Consumption of domestically produced natural gas increased slightly while direct consumption of imported LNG rose to 18.8 million tons resulting from increasing use of LNG for electric power generation by the utility industry.

According to a revised long-term energy supply and demand outlook that was released by MITI in December 1983, the share of imported oil that included crude oil, petroleum products, and liquefied petroleum gas declined to 61.6% of Japan's primary energy supply in fiscal year 1982 from 63.5% in fiscal year 1981. On the contrary, the share of LNG rose to 6.6% in fiscal year 1982 from 5.9% in fiscal year 1981.

In 1983, a noticeable change occurred in the supply pattern of Japan's crude oil imports. The share of major international companies dropped to 34.1% in 1983 from 43.2% in 1982, and the share of other independent international companies remained between 3.3% and 3.4%. However, the share of foreign national oil companies through direct deals and on a government-to-government basis rose to 53.3% in 1983 from 44.8% in 1982, and the share of Japanese oil companies operating overseas also increased to 9.3% in 1983 from 8.6% in 1982. Imports of crude oil by country of origin were as follows: Saudi Arabia, 28.1%; the United Arab Emirates, 15.1%; Indonesia, 14%; Iran, 11%; China, 5.2%; Oman, 4.9%; Mexico, 3.8%; Qatar, 3.7%; and other countries, 14.2%. Imports of crude oil by region were as follows: the Middle East, 70.5%; the Far East including Southeast Asia and China, 23.3%; Latin America, 4.7%; Africa, 1.3%; and other including the U.S.S.R., 0.2%. Imports of crude oil from Iran jumped more than 71% from that of 1982 owing to lower prices offered by Iran. By the same reason, imports from Mexico also rose 40%. As a result, imports from Saudi Arabia were cut back by 23% from that of 1982.

Domestic production of crude oil was mainly from oilfields located in Niigata Prefecture and other oilfields in Akita and Yamagata Prefectures. The total output provided less than 0.2% of Japan's primary energy supply. Domestic natural gas production was mainly from natural gasfields located in Niigata and Chiba Prefectures, and a small quantity of natural gas was recovered from oilfields in Niigata and Akita Prefectures. The output of natural gas provided about 0.7% of Japan's primary energy supply.

Imports of LNG rose 8.1% to 18.8 million tons, of which 9.6 million tons was imported from Indonesia; 5.3 million tons, from Brunei; 1.8 million tons, from the United Arab Emirates; 1.1 million tons, from Malaysia; and 1 million tons, from the United States. Japan's LNG imports accounted for 75% of the world's marketed LNG. About 75% of imported LNG was consumed by the electric utility industry for power generation, 20% by the city gas industry for household service, and 5% by the iron and steel industry for steelmaking.

In June, Japex Offshore Ltd. reportedly discovered an oil and gas reservoir offshore Niigata Prefecture, about 200 miles north of Tokyo. The reservoir is the largest oil and gas deposit ever found in Japan. The No. 1 exploratory well has a yield of 5,200 barrels of crude oil and 15,538,500 cubic feet of natural gas per day. Two more exploratory wells were scheduled to be drilled by mid-1984. Commercial production was planned in 1985 if both wells prove successful. The quality of the crude oil is 36° API with specific gravity of 0.845.[16]

As a result of reorganization and restructuring of Japan's petroleum refinery industry, the industry's refining capacity was reduced by 16.3% to 4,972,610 barrels per day from 5,940,360 barrels per day in September. This voluntary reduction in capacity was based on the recommendation of MITI's petroleum advisory council made in May 1983 by scrapping refining plant facilities of 150,000 barrels per day, suspending refinery operations of 390,000 barrels per day, and scaling down plant facilities by 430,000 barrels per day. The industry was operating at 57% capacity, and at about 68% capacity after reorganization and restructuring. The advisory council reportedly was conducting various studies to further restructuring of the industry. These studies include reorganization of oil companies into a small number of companies through mergers, revision of the existing petroleum laws, and liberalization of refined petroleum products imports.[17]

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[1] Economist, Division of Foreign Data.

[2] U.S. Embassy, Tokyo, Japan. State Dep. Telegram 17760, Sept. 12, 1983.

Japan Metal Review (Tokyo). No. 564, Mar. 22, 1984, pp. 2-3.

[3] Where appropriate, values have been converted from Japanese yen (Y) to U.S. dollars at the rate of Y249.05=US$1.00 for 1982 and Y237.52=US$1.00 for 1983.

[4] Sumitomo Corp. (Tokyo). Nonferrous Metals in Japan. Apr. 1984, p. 66.

[5] Japan Metal Journal (Tokyo). V. 13, No. 23, June 6, 1983, p. 3.

U.S. Embassy, Tokyo, Japan. State Dep. Telegram 10538, June 7, 1983.

[6] Metal Bulletin Monthly (London). Apr. 1984, p. 67.

[7] The Japan Economic Journal (Tokyo). Industrial Review of Japan. 1984, pp. 107-108.

[8] Bulletin of Japan Mining Industry Association (Tokyo). No. 389, Aug. 1983, p. 111.

[9] American Metal Market. V. 91, No. 61, Mar. 19, 1983, p. 6.

[10] Arumu Publishing Co. (Tokyo). Industrial Rare Metals. No. 81, Annual Review 1983, p. 83.

TEX Report Ltd. (Tokyo). Ferroalloy Manual 1983. P. 212.

[11] The Cement Association of Japan (Tokyo). Cement Statistics in Japan. 1983, p. 2.

[12] The British Sulphur Corp. Ltd. (London). Phosphorous & Potassium. No. 125, May-June 1983, p. 17.

[13] Japan Chemical Week (Tokyo). V. 25, No. 1259, May 7, 1984, p. 3.

[14] U.S. Embassy, Tokyo, Japan. State Dep. Telegram, Sapporo 0134, July 19, 1983.

Mining Journal (London). July 15, 1983, p. 48.

[15] U.S. Embassy, Tokyo, Japan. State Dep. Telegram 23503, Dec. 5, 1983.

[16] ———. State Dep. Telegram 10309, June 1983.

[17] ———. State Dep. Telegram 19668, Oct. 1983.

The Mineral Industry of Jordan

By Peter J. Clarke[1]

Jordan's mineral industry continued its rapid development in 1983, boosted by gains in the production of phosphate rock, and the first full year of operation of the potash works on the Dead Sea and the fertilizer manufacturing plant at Aqaba. Phosphate rock production, as usual, was the leading commodity, providing nearly one-third of the country's export revenues, despite depressed demand worldwide for phosphate. For the first time, Jordan introduced a new system in which companies bidding for new contracts in Jordan would take between 35% and 50% of the contract value in the form of raw phosphate rock. In addition, contracts would be awarded to companies that already import substantial quantities of Jordanian phosphates. Potash was expected to rank second only to phosphate as the country's revenue-earning exports as production is gradually brought up to full capacity. Phosphate was also used with imported sulfur and ammonia to produce diammonium phosphate (DAP) and monoammonium phosphate (MAP) fertilizer in the country's newest and largest manufacturing facility, the Jordan Fertilizer Industry Co. (JFI). Other minerals of significance include cement, crude steel, stone, sand, marble, and other crude construction materials.

In the energy sector, Jordan continued to import all of its crude oil needs, while producing refined products in the country's only refinery at Zarqa. However, reports of a commercial oil discovery in the Al-Azraq region in northern Jordan stirred hopes of reducing the country's reliance on its oil producing neighbors for its energy needs.

PRODUCTION AND TRADE

Production of most minerals increased, led by an 8% increase in phosphate rock output, the ninth consecutive year of production increases in that industry. Significant gains were also posted by the Arab Potash Co. (APC), after commencing commercial production late in 1982. Cement and lime production reached their highest levels ever. Small quantities of crude oil were also produced in 1983 from a test well in Al-Azraq, and both crude oil and oil shale in the Lajjun area were being viewed as potential sources of new energy.

Jordan's external trade sector remained stable, although several factors resulted in low export revenues and a sharply lower rate of economic expansion during the year. Overall economic growth was projected at 3%, a sharp drop from the 1975-80 average of 9% per year. Reasons for this slowdown included depressed demand worldwide for phosphate rock; lower than expected levels of aid payments from its Arab neighbors; a lower level of reexports to Iraq, one of its leading trading partners; and a reduced inflow of remittances from Jordanians working in other Arab oil states, owing to the slowdown in the oil market. Export earnings from industry and mining combined rose almost 4%, which helped to offset the decline in other sectors. Exports of phosphate rock earned $144 million for Jordan.

Jordan's nominal gross domestic product (GDP) was $4.1 billion[2] while real GDP, at constant 1980 prices, totaled $3.4 billion. Total exports reached $1.76 billion, down 4.5% from those of 1982. Total imports climbed to over $3.1 billion, leaving a substantial deficit in the trade balance, as has been common for the past several years.[3]

Table 1.—Jordan: Production of mineral commodities[1]

Commodity	1979	1980	1981	1982^{p}	1983^{e}
Cement, hydraulic metric tons	^{r}623,000	^{r}912,700	964,700	795,000	[2]1,271,332
Clays do.	25,000	30,000	20,000	14,335	[2]7,817
Gypsum do.	36,000	^{r}45,000	53,054	39,959	[2]41,187
Iron and steel: Steel, crude do.	^{r}80,961	^{r}86,173	134,900	140,000	140,000
Lime do.	3,500	3,500	20,000	59,839	[2]267,093
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	2,465	2,263	^{e}2,550	^{e}2,925	2,950
Jet fuel do.	1,104	1,759	^{e}1,800	^{e}2,000	1,900
Kerosine do.	1,062	1,314	1,327	^{e}1,600	1,500
Distillate fuel oil do.	3,499	3,509	^{e}3,550	^{e}3,800	5,000
Residual fuel oil do.	2,584	3,312	^{e}3,350	^{e}3,600	4,000
Liquefied petroleum gas do.	^{e}565	475	^{e}500	^{e}650	675
Asphalt do.	^{e}730	581	^{e}600	^{e}700	725
Unspecified including lubricants^{e} do.	55	50	60	65	70
Refinery fuel and losses^{e} do.	635	637	700	750	750
Total do.	12,699	^{e}13,900	^{e}14,437	^{e}16,090	17,570
Phosphate:					
Mine output thousand metric tons	2,825	3,911	4,244	4,390	[2]4,748
P_2O_5 content^{e} do.	918	1,271	1,379	1,427	1,544
Phosphatic fertilizer metric tons	--	--	NA	117,000	[2]365,122
Potash:					
Crude salts do.	--	--	--	15,000	280,000
K_2O equivalent do.	--	--	--	9,100	170,000
Salt^{e} thousand metric tons	30	30	30	50	80
Stone:					
Limestone metric tons	^{e}6,000	4,182	^{e}7,000	7,000	7,000
Marble do.	5,000	5,000	5,000	5,100	[2]102

^{e}Estimated. ^{p}Preliminary. ^{r}Revised. NA Not available.

[1] Table includes data available through June 1, 1984.

[2] Reported figure.

Table 2.—Jordan: Exports and reexports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	916	896	--	Kuwait 338; Sharjah 223; Netherlands 150.
Copper: Metal including alloys, all forms	585	541	--	Kuwait 301; Belgium-Luxembourg 127; West Germany 36.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	--	36,395	--	All to Switzerland.
Iron and steel: Metal:				
Scrap	--	63	--	Saudi Arabia 59; Kuwait 4.
Semimanufactures, unspecified	7,026	7,955	4	Iraq 7,429; Saudi Arabia 324; Kuwait 118.
Lead: Metal including alloys, unwrought	110	386	--	Saudi Arabia 376; Lebanon 10.
Titanium: Oxides	--	41	--	Saudi Arabia 26; Iraq 15.
Tungsten: Metal including alloys, all forms	--	16	--	All to United Kingdom.
Zinc: Metal including alloys, all forms	545	429	--	Syria 290; Lebanon 120.
NONMETALS				
Abrasives, n.e.s.: Natural: Corundum, emery, pumice, etc	146	--		
Asbestos, crude	--	95	--	Mainly to Saudi Arabia.
Cement	854	2,716	--	Iraq 2,205; Syria 404; Lebanon 100.
Clays, crude: Kaolin	10,439	7,756	--	All to Lebanon.
Fertilizer materials: Manufactured:				
Ammonia	--	29	--	Syria 17; Lebanon 1.
Gypsum and plaster	--	520	--	Iraq 518; Saudi Arabia 2.
Lime	6,551	5,109	--	Iraq 5,037; Kuwait 50; Saudi Arabia 22.
Magnesium coumpounds: Magnesite	--	520	--	Iraq 518.
Mica: Crude including splittings and waste	--	6,214	--	Iraq 4,430; Saudi Arabia 1,016; Kuwait 584.
Phosphates, crude thousand tons	3,529	3,570	--	Romania 726; India 583; Poland 256.

See footnotes at end of table.

Table 2.—Jordan: Exports and reexports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982 United States	Destinations, 1982 Other (principal)
NONMETALS —Continued				
Salt and brine	7,072	1,674	--	Iraq 1,546; Qatar 128.
Sodium compounds, n.e.s.: Sulfate, natural and manufactured	335	--		
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	139,589	113,855	--	Iraq 100,265; Lebanon 7,403; Kuwait 4,641.
Worked	56,309	99,762	--	Kuwait 79,095; Iraq 11,105; Abu Dhabi 5,200.
Gravel and crushed rock	3,352	--		
Sand other than metal-bearing	4,456	12,515	--	Lebanon 8,207; Kuwait 2,855; Saudi Arabia 698.
Sulfur: Sulfuric acid	364	678	--	Iraq 480; Saudi Arabia 198.
Talc, steatite, soapstone, pyrophyllite	1,058	5,347	--	Iraq 3,758; Saudi Arabia 1,005; Kuwait 584.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	143	--	Iraq 121; Saudi Arabia 22.
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	1,640	--		
Gasoline do.	94	--		
Lubricants do.	427	455	--	Iraq 196; Lebanon 154; Saudi Arabia 105.
Bituminous mixtures do.	--	1,150	--	Iraq 965; Saudi Arabia 177.

[1] Table prepared by Virginia A. Woodson.

Table 3.—Jordan: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982 United States	Sources, 1982 Other (principal)
METALS				
Aluminum:				
Ore and concentrate	451	--		
Metal including alloys:				
Scrap	77	239	--	Saudi Arabia 224.
Unwrought	445	518	--	Saudi Arabia 252; Canada 247.
Semimanufactures	7,280	5,943	39	Greece 2,635; Italy 924; Bulgaria 614.
Chromium: Oxides and hydroxides	--	140	--	Romania 88; West Germany 42.
Cobalt: Oxides and hydroxides	--	1	--	All from Denmark.
Copper: Metal including alloys:				
Scrap	89	133	--	Saudi Arabia 123; Japan 7.
Unwrought	10	60	--	All from Italy.
Semimanufactures	554	520	27	Taiwan 188; Sweden 64; Japan 49.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	6,687	75,779	32	Switzerland 69,960; Saudi Arabia 3,376.
Iron and steel: Metal:				
Scrap	5,573	2,468	--	Kuwait 1,363; Saudi Arabia 789; China 189.
Pig iron, cast iron, related materials	20,729	63,164	--	India 21,800; Netherlands 10,000; Brazil 9,999; Cuba 9,996.
Ferroalloys: Ferrosilicon	--	18	--	All from United Kingdom.
Steel, primary forms	124,258	15,095	--	Spain 14,941; West Germany 88.
Semimanufactures: Unspecified	243,314	213,039	792	Japan 32,242; France 17,308; China 15,015; U.S.S.R. 14,824.
Lead:				
Oxides	37	16	1	France 15.
Metal including alloys:				
Unwrought	1,377	1,078	--	Saudi Arabia 1,044; Syria 30.
Semimanufactures	29	--		
Manganese: Oxides	--	69	--	West Germany 64; Switzerland 5.
Nickel: Metal including alloys, all forms	17	5	--	All from Canada.
Platinum-group metals: Unspecified troy ounces	643	--		
Silver: Metal including alloys, unwrought and partly wrought do.	5,851	39,995	20,705	Switzerland 19,290.

See footnotes at end of table.

Table 3.—Jordan: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Titanium: Oxides	1,338	1,135	504	United Kingdom 432; Italy 60; West Germany 49.
Zinc: Metal including alloys:				
Scrap	--	161	--	Japan 141; West Germany 20.
Unwrought	974	320	--	Belgium-Luxembourg 300; West Germany 20.
Semimanufactures	24	242	--	Belgium-Luxembourg 106; Japan 99.
Other: Base metals including alloys, all forms	40	1	--	All from West Germany.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	494	2	--	All from Italy.
Grinding and polishing wheels and stones	582	546	--	Italy 326; West Germany 75; Republic of Korea 38.
Asbestos, crude	1,047	--		
Cement thousand tons	705	1,088	--	U.S.S.R. 361; Greece 294; Turkey 189.
Chalk	703	359	--	Normandy 108; United Kingdom 57; France 54.
Clays, crude: Unspecified	2,617	1,444	--	India 450; United Kingdom 435; Greece 200.
Cryolite and chiolite	44	--		
Diamond:				
Gem, not set or strung carats	15,000	--		
Industrial do	5,000	--		
Diatomite and other infusorial earth	214	122	28	France 59; West Germany 35.
Feldspar, fluorspar, related materials	485	405	--	Turkey 305; France 100.
Fertilizer materials: Manufactured:				
Ammonia	220	22,082	7,994	Romania 7,955; France 500; Syria 105.
Nitrogenous	9,424	24,767	25	Algeria 7,747; Netherlands 5,733; Bulgaria 4,000.
Phosphatic	11,516	14,765	--	Lebanon 3,024; Netherlands 2,812; Bulgaria 2,150.
Potassic	1,774	1,117	--	Netherlands 1,096; West Germany 21.
Unspecified and mixed	2,685	6,078	54	Greece 4,000; Iraq 1,097; Hungary 500.
Gypsum and plaster	1,984	2,178	--	Lebanon 665; Syria 610; Iraq 230; France 214.
Lime	1,511	1,008	--	All from Lebanon.
Magnesium compounds: Magnesite	--	82	--	Greece 44; Italy 24; West Germany 10.
Pigments, mineral: Iron oxides and hydroxides, processed	86	184	--	West Germany 121; United Kingdom 30; China 15.
Precious and semiprecious stones other than diamond: Synthetic carats	15,000	25,000	--	Belgium-Luxembourg 10,000; Thailand 10,000.
Salt and brine	1,965	528	40	Turkey 321; Saudi Arabia 129; France 20.
Sodium compounds, n.e.s.:				
Carbonate, natural and manufactured	812	786	--	Poland 200; China 184; Romania 150.
Sulfate, natural and manufactured	2,177	947	--	Romania 400; Saudi Arabia 230; Belgium-Luxembourg 105.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	8,748	15,727	--	Italy 7,929; Turkey 3,408; Greece 1,187.
Worked	1,420	1,087	--	Italy 870; Greece 91; Lebanon 77.
Gravel and crushed rock	2,414	3,688	--	Turkey 1,255; Italy 1,200; Lebanon 891.
Sand other than metal-bearing	340	696	8	Greece 160; Syria 104; West Germany 101; Netherlands 96.
Sulfur:				
Elemental:				
Crude including native and byproduct	990	31,595	--	Canada 31,443; West Germany 115.
Colloidal, precipitated, sublimed	948	27,409	--	Canada 26,000; Iraq 725; France 500.
Sulfuric acid	260	2,440	--	Kuwait 1,500; Lebanon 649; Syria 289.
Talc, steatite, soapstone, pyrophyllite	365	640	--	China 265; Austria 156; Norway 109.
Other: Crude	246	--		

Table 3.—Jordan: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	87	--		
Carbon: Carbon black	--	38	--	West Germany 34; Belgium-Luxembourg 2.
Coal: All grades including briquets	384	207	33	West Germany 148; Belgium-Luxembourg 25.
Coke and semicoke	1,958	360	--	France 197; Japan 150.
Peat including briquets and liter	40	455	--	Netherlands 363; Finland 92.
Petroleum:				
Crude thousand 42-gallon barrels	15,850	18,522	(2)	Saudi Arabia 18,520.
Refinery products:				
Liquefied petroleum gas 42-gallon barrels	371	--		
Gasoline do.	818	2,079	--	Saudi Arabia 1,509; Syria 407; Singapore 162.
Mineral jelly and wax do.	1,165	1,629	--	West Germany 1,007; China 614.
Kerosine and jet fuel do.	471	--		
Lubricants do.	124,537	191,926	13,153	France 49,112; Saudi Arabia 45,724; Belgium-Luxembourg 26,194.
Residual fuel oil do.	4,782	3,757	--	Saudi Arabia 1,598; Syria 432.
Bituminous mixtures do.	3,703	3,312	346	Austria 989; United Kingdom 611; Belgium-Luxembourg 306.
Unspecified do.	868	--		

[1] Table prepared by Virginia A. Woodson.
[2] Less than 1/2 unit.

COMMODITY REVIEW

NONMETALS

Cement.—Cement production reached an alltime high in Jordan in 1983. Capacity of the Jordan Cement Factories Co. plant at Fuheis was expanded from 700,000 to 1.3 million tons per year through the addition of two new kilns. A second cement plant was expected to further augment the country's production capacity in 1984. The Southern Cement Co. Ltd. was constructing a 2-million-ton-per-year plant at Rashadiyah, the first line of which was expected on-stream in February 1984, followed by the second line in August 1984.[4] Production from both plants was expected to more than satisfy the country's domestic requirements for cement. Consumption of cement in Jordan was estimated at close to 2 million tons per year in 1983.

Fertilizer Materials.—JFI's $400 million phosphatic fertilizer plant was officially inaugurated in November 1982 and produced approximately 300,000 tons of DAP and 60,000 tons of merchant-grade phosphoric acid in 1983. The plant consisted of two twin 1,800-ton-per-day sulfuric acid units, a 1,250-ton-per-day phosphoric acid plant, two parallel 1,100-ton-per-day DAP granulation units capable of producing either DAP or MAP, storage facilities, and two bagging plants. A 20,000-ton-per-year aluminum fluoride plant was also under construction at the sight. Sulfur and ammonia for the plant were imported. JFI's output of DAP and phosphoric acid was to be entirely exported. Mitsubishi Corp. of Japan was to take 35% of the plant's output for sale east of the Suez Canal. Woodward & Dickerson Inc. of the United States was to market another 35% of the output west of the canal, while JFI was to market the remainder, mostly through direct government-to-government contracts. JFI signed an agreement with China to market 55,000 tons of DAP to that country in 1984. Jordan Phosphate Mines Co. (JPMC) sold JFI 620,000 tons of phosphate rock in 1983, while sulfur was imported from Saudi Arabia, Canada, and Poland, and ammonia was imported from Kuwait and Qatar.

Phosphate Rock.—Production from

JPMC's three operating mines at Ruseifa, El-Hasa, and Wadi-El-Abyad continued to expand as plans were drawn up to develop a fourth deposit at Ash-Shidiyah in southern Jordan by 1988. Since 1979, phosphate production has increased over 68% to 4.75 million tons in 1983.

Ruseifa, the country's oldest mine, 14 kilometers north of Amman, produced approximately 1 million tons per year of phosphate rock containing 64.5% bone phosphate of lime (BPL). JPMC's largest mine was located at El-Hasa, 140 kilometers south of Amman, where higher grade, 64% to 72% BPL phosphate rock was being mined by JPMC and contractors. Capacity of the El-Hasa Mine was 3 million tons per year, consisting of both standard grade, 70% to 72% BPL, unbeneficiated direct shipping ore, and higher grade, 73% to 75% BPL material beneficiated from 64% to 66% BPL ore. JPMC's newest mine was at Wadi-El-Abyad, 20 kilometers north of El-Hasa and basically an extension of the same deposit. Capacity at Wadi-El-Abyad was about 1.2 million tons per year of phosphate rock. Reserves at El-Hasa and Wadi-El-Abyad combined totaled 158 million tons measured reserves containing 65% BPL, and another 40 million tons indicated reserves containing 66% BPL. Reserves at Ruseifa were below 50 million tons.

JPMC was planning to raise production at these three existing mines to 6 million tons per year by the end of 1984. To finance the expansion, JPMC in 1983 borrowed $20 million from Jordan Investment and Finance Corp. and the National Bank of Kuwait to install additional mining and beneficiation equipment. A third beneficiation line was installed at Wadi-El-Abyad, raising milling capacity from 450 to 675 tons per hour. Phosphate rock from all three mines was transported by both rail and truck to Aqaba for export.

Total sales of phosphate rock reached 4.3 million tons, 3.7 million tons of which was exported, with the remaining quantity delivered to JFI's plant at Aqaba. Approximately 450,000 tons of crude phosphate rock was added to JPMC's already high inventory level in 1983, as the company awaited a market upturn to draw down its stocks. The main purchasers of JPMC's output were Romania, 27%; India, 18%; Poland, 10%; Japan, 9%; Yugoslavia, 8%; Turkey, 5%; with another 15% going to Western European countries. JPMC signed new marketing agreements with the Republic of Korea for 54,000 tons in 1983, rising to 150,000 tons in 1984, and with Italy for 70,000 tons in 1984. The Jordanian Government announced a new incentive program in 1983 to encourage new customers for its phosphate. The plan was for companies bidding on any new industrial or overall development project in Jordan to take between 35% and 50% of the contract value in the form of raw phosphate rock. Companies that already import large quantities of Jordanian phosphate were also to be given preference in the awarding of these new contracts. The move was designed both to boost phosphate exports and to relieve pressure on Jordan's foreign exchange reserves, which were being hard hit by large trade imbalances, mostly with Western European countries.[5]

Potash.—Potash production from APC's Dead Sea potash works scaled up to commercial level, with output for the year totaling 280,000 tons of muriate of potash, only 20,000 tons short of the production goal for the year. The $425 million potash recovery project was Jordan's largest single industrial venture, and reportedly one of the world's largest applications of solar energy. Potash was recovered from Dead Sea brine, which contained almost unlimited reserves of carnallite, the potassium salt from which potassium chloride (KCl) is derived. The plant consisted of 65 kilometers of earthen dikes that retained brine in successive stages of evaporation, a processing refinery capable of producing 1.2 million tons of KCl, a 17-megawatt powerplant, and a 400-unit residential community. The plant is located at Safi, near the southern end of the Dead Sea where the evaporation rate was among the highest in the world. Carnallite is crystallized by solar evaporation, harvested by laser-guided, semisubmerged harvesting machines, pumped through a floating pipeline to the edge of the salt pan, and then on to the refinery over 1 kilometer away. The carnallite slurry is then dewatered, recrystallized, and processed into muriate of potash. Only two of five harvesting machines operated in 1983, and full capacity of the plant was not expected to be reached until 1985.

The project was owned by the Government of Jordan, 51%; the Arab Mining Co., 25%; Islamic Bank, 6.34%; and the Governments of Iraq, Libya, Kuwait, Saudi Arabia, and other private shareholders. Marketing agreements for the plants' output were signed by Mitsubishi for Asia, New Zealand, and Australia; Woodward & Dickerson for North, Central, and South America; Entreprise Minière et Chimique S.A. for Western

Europe; and IMIC Holdings for Eastern Europe. APC also planned to construct a plant to recover magnesium, bromine, and potassium sulfate as byproducts from the refinery effluent. Also under consideration in 1983 was a plan to double APC's capacity, under the second stage of the project, to 2.4 million tons per year later in the decade.

MINERAL FUELS

Petroleum exploration in Jordan took an unexpected turn for the better, as new exploration wells were drilled in high potential areas. One well, drilled in Barma, in the Al-Azraq region near the Saudi border, struck oil and reportedly flowed at 400 barrels per day from a depth of 5,580 feet. After 29 years of exploration, mainly by foreign companies, the National Resources Authority, using technical personnel and drilling rigs from the Yugoslav firm NAFTAGAS and the Iraq National Oil Co., made the discovery late in 1983. Although commercial exploitation of Jordan's new found oil was still far into the future, tests from the discovery well yielded a distillation content of 55% fuel oil, 35% kerosine and gas oil, and 10% gasoline.[6]

In addition, Al-Azraq was only 60 kilometers from Jordan's only refinery, the 60,000-barrel-per-day Zarqa refinery owned by the Jordan Petroleum Refinery Co. All feedstock for the refinery was supplied by Saudi Arabia via the Trans-Arabian Pipeline (TAPline). TAPline announced in November that by 1986, its operations in Jordan would be phased out, in addition to closing its facilities in Syria and Lebanon. This would leave Jordan without a supplier by the end of 1985.[7]

Late in 1983, Jordan agreed on a new pipeline project from Iraq to Jordan, providing Jordan with a new potential supplier of crude oil, and a much-needed crude oil export terminal for Iraq. Capacity of the line was projected at 1 million barrels per day, starting from the K3 pump station at Hadaitha, 200 kilometers northwest of Baghdad, and running the entire length of Jordan to the Port of Aqaba.[8] Bechtel Corp. of the United States, was awarded the design contract for the line, which was to be built in 500,000-barrel-per-day stages, with a possible link to Saudi Arabia's East-West Pipeline from Ras Tanura to Yanbu. The pipeline was expected to be completed by the end of 1985.[9]

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Jordanian dinars (JD) to U.S. dollars at the rate JD0.363=US$1.00.

[3] International Monetary Fund. International Financial Statistics. Apr. 1984, pp. 269-270.

[4] Rock Products. V. 87, No. 4, Apr. 1984, p. 56.

[5] Journal of Commerce. U.S. Department of Commerce, Washington, DC. Dec. 3, 1983, p. 18.

[6] Middle East Economic Survey. V. 27, No. 13, Jan. 9, 1984, p. A8.

[7] Petroleum Economist (London). V. 2, No. 84, Feb. 2, 1984, p. 73.

[8] Middle East Economic Survey. V. 27, No. 17, Feb. 6, 1984, pp. A1-A2.

[9] ———. V. 27, No. 22, Mar. 12, 1984, p. A3.

The Mineral Industry of the Republic of Korea

By E. Chin[1]

Although the Republic of Korea is a significant mine producer of graphite, kaolin, pyrophyllite, talc, and tungsten, it is deficient in most mineral raw materials required by the country's manufacturing industry. Korea's largest metallurgical sector is iron and steel, which must import almost all of its needs for iron ore, manganese, and coking coal. Aluminum and copper are also produced from imported raw materials. Although mine output of anthracite coal averages 18 million tons annually, there is no domestic production of oil and natural gas.

The country's gross national product (GNP) in 1983 was estimated at $69.6 billion[2] at current prices. GNP at constant 1975 prices was $34.9 billion in 1983 compared with $32 billion in 1982, representing a real growth of close to 9%. Per capita GNP, one of the highest in the Far East, was $1,743. The total value of mining and quarrying output was less than $400 million compared with about $12 billion for manufacturing.

The total labor force in 1983 was estimated at 14.5 million persons. Employment in the mining sector was 108,000 compared with 3.3 million for manufacturing; 4.3 million for agriculture, forestry, and fishing; and 6.8 million for services. Monthly earnings for all industries averaged $343 per person. Monthly earnings per person for various sectors of the economy were as follows: mining, $360; manufacturing, $284; utilities, $595; and construction, $484. Indices for labor productivity (1980=100) in 1982, the last current year for which 12-month data are available, were coal mining, 90; metal mining, 115; nonmetal mining, 110; petroleum refinery, 92; iron and steel, 132; nonferrous metals, 172; and fabricated metal products, 143.[3]

The wholesale price index (1980=100) for all commodities in 1983 was 126. Indices for select products were chemicals, 123; nonmetallic products, 128; iron and steel, 117; nonferrous metals, 110; petroleum, 138; and electricity, 143. Wholesale prices for selected commodities were compound fertilizers, $0.23 per kilogram; cement, $0.06 per kilogram; reinforced steel bar, $259 per ton; galvanized sheet, $764 per ton; hot-rolled steel coil, $290 per ton; wire rod, $305 per ton; gold, $14.24 per gram; electrolytic copper, $2,057 per ton; aluminum sash bar, $2.85 per kilogram; and anthracite, $38.30 per ton.

The country's nuclear power unit Kori No. 3, a Canadian deuterium-uranium heavy water-type reactor, began commercial operation in the spring of 1983, supplementing the output of Korea's first nuclear unit in Kori. The second nuclear power unit (Kori No. 2) went on-stream in the summer. The latter unit was expected to generate 4 billion kilowatt hours per year, equivalent to a savings of 6 million barrels of oil imports annually. Wolsung units Nos. 5 and 6 (there is no power unit No. 4) are pressurized water-type reactors and were scheduled for completion in late 1985 and in 1986, respectively.[4]

Because of limited indigenous mineral resources, the Government encourages the development of foreign resource development through South Korean participation rather than rely solely on contracts and spot purchases of imports of raw materials.

The Overseas Resources Development Division of Korea Mining Promotion Corp. (KMPC) encourages private companies to participate in developing small- to medium-size mines and to increase the number of projects undertaken. First location priority was given to the Pacific region (Indonesia and Australia) and to North America. KMPC also encourages participation in projects in developing countries. There is South Korean participation in Gabon, and further ventures in continental Africa as well as in South America are contemplated. Efforts are also made to create auxiliary firms linked with mine development projects, such as engineering, construction, and transportation. The Government provides subsidies for exploration and grants loan development funds to developers on a long-term, low-interest basis. First priority is given to energy resources (coal and uranium) and then to metallic minerals required by the country's major industries.[5]

PRODUCTION

In terms of world output, the Republic of Korea is a significant producer of graphite, kaolin, pyrophyllite, talc, and tungsten, although mine output of anthracite coal was the most important sector by volume and value. There is no domestic production of oil and natural gas. Most of the country's mineral raw materials requirements are imported. For instance, production of aluminum metal is all from imported materials, while production of copper and iron is almost wholly from imported ores. In addition, the iron and steel industry imports all of its needs for manganese and coking coal. Domestic mine production of lead and zinc, however, provides about 60% of the ore requirements for smelter output of these metals.

The industrial production index (1980=100) for all items in 1983 was 136 compared with 98 for mining, 138 for manufacturing, and 131 for electricity. The index for coal mining was 89; for metal mining, 101; and for all other mining, 128. Other indices included petroleum refining, 115; nonmetal mineral products, 135, iron and steel, 152; nonferrous metals, 216; and fabricated metal products, 165.

Table 1.—Republic of Korea: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983^{p}
METALS					
Aluminum metal, primary	21,751	17,643	17,506	15,226	12,629
Arsenic, mine output, white arsenic equivalent	NA	NA	169	306	560
Bismuth metal	87	123	100	95	100
Cadmium metal, smelter	50	365	300	320	320
Copper:					
Mine output, metal content	475	372	501	320	648
Metal:					
Smelter	48,200	64,100	101,200	119,400	103,000
Refined, primary	63,082	72,931	107,984	110,818	123,289
Gold metal troy ounces	24,081	41,218	43,147	55,750	72,083
Iron and steel:					
Ore and concentrate:					
Gross weight thousand tons	639	619	594	620	655
Iron content do	358	347	333	347	367
Metal:					
Pig iron do	5,063	5,577	7,928	8,445	8,024
Ferroalloys:					
Ferromanganese	53,000	54,279	68,300	60,306	52,896
Ferromolybdenum	203	--	--	--	230
Ferrosilicon	38,000	29,712	32,000	32,478	32,489
Other	^{r}20,948	24,994	27,185	33,240	43,594
Total	112,151	108,985	127,485	126,024	129,209
Steel, crude thousand tons	7,610	8,558	10,753	11,753	11,916
Lead:					
Mine output, metal content	11,073	11,457	13,635	12,167	12,226
Metal, smelter	^{r}7,100	^{r}8,600	^{r}7,200	9,500	10,500

See footnotes at end of table.

Table 1.—Republic of Korea: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983[p]
METALS —Continued					
Manganese ore and concentrate:					
Gross weight	35	81	--	--	--
Manganese content	14	32	--	--	--
Molybdenum, mine output, metal content	189	300	464	361	142
Silver metal thousand troy ounces	2,278	2,292	3,061	3,237	2,140
Tin, mine output, metal content	[r]26	[r]7	--	--	7
Tungsten, mine output, metal content	2,713	2,737	2,739	2,420	2,480
Zinc:					
Mine output, metal content	62,477	56,787	56,198	58,175	55,980
Metal, primary	83,014	79,150	83,915	99,211	107,860
NONMETALS					
Asbestos	14,804	9,854	14,084	15,933	12,506
Barite	728	410	--	--	552
Cement, hydraulic thousand tons	16,413	[r]15,612	15,617	17,887	21,282
Clays: Kaolin	698,432	577,761	694,584	625,824	684,447
Diatomaceous earth	23,915	25,101	42,176	55,249	55,968
Feldspar	36,238	71,972	103,263	85,040	109,896
Fluorspar, metallurgical-grade	8,450	6,912	6,464	3,667	6,361
Graphite:					
Crystalline	2,453	1,429	842	627	695
Amorphous	54,240	59,157	34,049	26,338	32,571
Total	56,693	60,586	34,891	26,965	33,266
Kyanite and related materials: Andalusite	60	82	90	33	289
Lime, slaked thousand tons	NA	210	NA	NA	NA
Mica: All grades	10,005	10,330	NA	20,355	14,402
Nitrogen: N content of ammonia	960,623	847,871	746,723	543,302	430,169
Pyrites, gross weight	562	460	--	--	529
Salt	500,000	455,000	602,000	864,000	481,000
Sodium compounds: Sodium carbonate, manufactured	203,792	221,920	202,063	185,670	230,000
Stone, sand and gravel:					
Agalmatolite	430,890	371,932	302,975	315,800	NA
Limestone thousand tons	28,112	28,024	27,931	30,766	32,992
Quartzite do	392	291	545	490	842
Sand including glass sand do	513	510	585	657	1,223
Sulfur: S content of pyrites	169	138	--	--	127
Talc and related materials:					
Pyrophyllite	541,383	514,511	395,216	466,324	460,922
Talc	236,824	204,662	169,401	124,793	171,214
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	58,284	[r]67,122	[r]60,943	58,047	75,424
Coal: Anthracite thousand tons	18,208	18,624	19,865	20,116	18,945
Coke do	2,331	2,965	4,401	4,539	4,682
Fuel briquets: Anthracite briquets	16,942	17,000	18,543	20,865	18,932
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	8,712	6,759	6,184	5,182	4,902
Jet fuel do	5,495	4,920	5,409	6,521	9,074
Kerosine do	8,912	8,884	8,124	8,368	9,199
Distillate fuel oil do	38,056	38,527	39,167	41,701	48,560
Residual fuel oil do	91,135	91,412	86,613	81,679	87,140
Lubricants do	1,512	1,403	1,507	2,081	1,733
Other do	27,747	29,709	30,744	26,577	30,860
Refinery fuel and losses[e] do	7,024	1,247	5,068	6,260	6,700
Total do	188,593	182,861	182,816	178,369	198,168

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Includes data available through July 6, 1984.

TRADE

Total trade of the Republic of Korea continued to expand and was valued at $50.6 billion in 1983 compared with $46.1 billion in 1982. The Government continued to support vigorously its export policy, and the annual trade deficit declined from $4.9 billion in 1981, to $2.4 billion in 1982, and to $1.8 billion in 1983.

Total exports were valued at $24.4 billion. Major destinations were the United States with $8.1 billion; Japan, $3.4 billion; Saudi Arabia, $1.4 billion; the United Kingdom, $1.0 billion; Hong Kong and the Federal Republic of Germany, each with $0.8 billion; and Canada, $0.6 billion. The major export commodity groups included shipments of machinery and transportation equipment, $8.0 billion; other manufactured goods, $7.8 billion; and food products, $1.1 billion.

Import value totaled $26.2 billion. Major supplying countries were the United States, $6.3 billion; Japan, $6.2 billion; Saudi Arabia, $2.0 billion; Australia, $1.0 billion; Malaysia, $0.8 billion; Kuwait, $0.7 billion; and the Federal Republic of Germany, $0.6 billion. Receipts of machinery and transportation equipment were the largest class, valued at $7.6 billion, followed by fuels, lubricants, and related materials, $7.0 billion; crude raw materials, $3.5 billion; manufactured goods, $3.0 billion; chemicals and related products, $2.2 billion; and food products, $1.7 billion.

Table 2.—Republic of Korea: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	45	10	--	Bangladesh 6; Pakistan 4.
Metal including alloys:				
Unwrought	935	30	NA	NA.
Semimanufactures	36,053	13,253	21	Saudi Arabia 6,961; Kuwait 1,256; Taiwan 663.
Antimony: Metal including alloys, all forms	20	--		
Arsenic: Oxides and acids	338	643	101	Malaysia 272; Taiwan 181; Bangladesh 50.
Bismuth: Metal including alloys, all forms	91	83	6	Netherlands 49; United Kingdom 23; Sweden 3.
Cadmium: Metal including alloys, all forms	336	152	71	Japan 41; Netherlands 30; India 10.
Copper:				
Sulfate	--	500	--	All to Panama.
Metal including alloys:				
Scrap	250	836	--	All to Japan.
Unwrought	3,387	10,710	2,000	Japan 8,314; Taiwan 395.
Semimanufactures	12,981	24,387	791	Taiwan 1,376; Japan 1,027; Singapore 852.
Gold:				
Ore and concentrate value, thousands	$11	$1,056	$1,056	
Metal including alloys, unwrought and partly wrought troy ounces	11,260	6,688	6,437	Japan 251.
Iron and steel: Metal:				
Scrap	25,109	140,608	--	Thailand 105,500; Indonesia 29,425; Japan 5,683.
Pig iron, cast iron, related materials	1,169,634	42,571	96	Japan 38,139; Taiwan 2,733; Jordan 1,500.
Ferroalloys	[r]168	344	--	Japan 338.
Steel, primary forms thousand tons	5,557	2,015	149	Japan 873; Philippines 262; Thailand 97.
Lead:				
Ore and concentrate	8,400	800	--	All to Japan.
Metal including alloys, all forms	213	316	3	Philippines 75; Saudi Arabia 50.
Magnesium: Metal including alloys, scrap	32	46	--	All to Japan.
Molybdenum: Ore and concentrate	651	360	85	West Germany 102; Netherlands 77; Belgium-Luxembourg 73.
Nickel: Metal including alloys, all forms	43	25	(2)	Japan 24.

See footnotes at end of table.

Table 2.—Republic of Korea: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals:				
Waste and sweepings value	$5,542	$94,986	--	All to United Kingdom.
Metals including alloys, unwrought and partly wrought troy ounces	r833	417	15	Japan 402.
Silver:				
Ore and concentrate value, thousands	$4,773	$5,557	$5,369	Belgium-Luxembourg $188.
Metal including alloys, unwrought and partly wrought thousand troy ounces	1,711	1,586	1,116	Japan 464.
Titanium: Oxides	1,023	1,990	--	Japan 1,945.
Tungsten:				
Ore and concentrate	6,360	1,005	--	Japan 394; West Germany 262; Sweden 179.
Oxides and hydroxides	23	100	--	Mainly to United Kingdom.
Metal including alloys, all forms	656	385	161	Japan 98; West Germany 50; United Kingdom 48.
Zinc:				
Oxides	1,829	1,676	--	Japan 1,514.
Blue powder	331	485	--	Australia 271; New Zealand 137.
Ash and residue containing zinc	50,913	2,082	--	All to Japan.
Metal including alloys:				
Scrap	2,200	397	--	Indonesia 350.
Unwrought	8,391	6,250	--	Japan 6,020.
NONMETALS				
Asbestos, crude	40	12	NA	Japan 10.
Cement	6,635	6,474	17	Saudi Arabia 1,392; India 818; Hong Kong 570.
Clays, crude	115,103	75,825	--	Japan 70,976; Taiwan 3,500.
Diamond:				
Gem, not set or strung:				
Natural value	$1,850,796	$236,888	$6,300	Japan $230,588.
Synthetic or reconstructed do	$348,920	$2,729	$2,729	
Unsorted do	--	$14,788	--	Japan $8,068; Hong Kong $6,720.
Feldspar	18,538	23,551	--	Taiwan 19,250; Japan 2,301; Thailand 2,000.
Fertilizer materials: Manufactured:				
Nitrogenous	393,946	301,019	NA	Philippines 123,050; Indonesia 28,300; Mozambique 20,000.
Phosphatic	37,350	51,490	--	Japan 29,600; Nigeria 11,000; Fiji 8,190.
Potassic	2,500	2,000	--	All to Fiji.
Unspecified and mixed	316,911	812,166	11,001	Thailand 192,860; Philippines 119,705; Bangladesh 23,800.
Graphite, natural	34,348	21,757	--	Japan 12,310; Taiwan 6,024; Indonesia 2,575.
Gypsum and plaster	160,884	355,296	--	Japan 277,798; Philippines 16,200; Bahrain 9,300.
Precious and semiprecious stones other than diamond:				
Natural kilograms	2,239	3 22,172	117	Taiwan 12,005; Hong Kong 5,390; Japan 4,506.
Synthetic value, thousands	$12,422	$11,364	$9,077	Japan $731; United Kingdom $416; Hong Kong $384.
Sulfur:				
Elemental: Crude including native and byproduct	880	2,028		Indonesia 1,844.
Sulfuric acid	1,529	2,010	NA	Philippines 1,938.
Talc, steatite, soapstone, pyrophyllite	50,444	41,836	2,287	Japan 19,800; Thailand 6,250; Philippines 5,402.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	3,362	1,316	NA	Sri Lanka 650; India 250; Pakistan 132.

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r Revised. NA Not available.

[1] Table prepared by Audrey D. Wilkes.

[2] Less than 1/2 unit.

[3] Excludes unreported quantity valued at $30,844; mainly to the United States.

Table 3.—Republic of Korea: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	4,907	5,334	--	Hong Kong 4,188; Japan 1,136.
Oxides and hydroxides	[r]65,855	56,951	664	Japan 51,995; Taiwan 3,744.
Metal including alloys:				
Scrap	5,669	7,299	5,756	Japan 1,184.
Unwrought	98,583	302,267	2,392	Australia 216,220; Canada 21,050; United Arab Emirates 16,397.
Antimony:				
Ore and concentrate	547	391	--	All from Thailand.
Oxides	100	126	NA	Japan 53; West Germany 26; United Kingdom 25.
Metal including alloys, all forms	5	82	(2)	Taiwan 16; Hong Kong 6.
Chromium:				
Ore and concentrate	3,501	4,846	--	Philippines 4,769.
Oxides and hydroxides	1,231	1,127	208	Japan 686; Italy 124.
Cobalt:				
Oxides and hydroxides	8	8	(2)	Canada 4; Japan 2.
Metal including alloys, all forms	54	88	3	Zaire 35; Japan 21.
Copper:				
Ore and concentrate	382,919	394,250	5,160	Philippines 147,006; Canada 87,568; Chile 63,974.
Matte and speiss including cement copper	2,398	8,495	138	Chile 5,411; Australia 2,729.
Oxides and hydroxides	49	155	38	Norway 77; Japan 39.
Metal including alloys:				
Scrap	25,736	94,433	86,964	Hong Kong 2,610; Singapore 2,026; Canada 944.
Unwrought	28,675	30,112	137	Japan 13,875; Peru 8,672; Chile 3,423.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	25,605	39,255	23,345	Japan 14,761; Singapore 649.
Iron and steel:				
Iron ore and concentrate, including roasted pyrite thousand tons	10,688	11,510	--	Australia 4,234; India 2,807; Brazil 2,249.
Metal:				
Scrap do	2,310	1,809	1,423	Australia 134; Taiwan 94; Japan 89.
Pig iron, cast iron, related materials	66,061	74,915	63	Taiwan 34,716; Hong Kong 6,967; Brazil 4,000.
Ferroalloys:				
Ferrochromium	1,340	3,821	9	Philippines 717; Japan 152; United Kingdom 113.
Ferromanganese	4,624	5,812	3	Japan 4,778; West Germany 226.
Ferromolybdenum	104	132	5	Netherlands 80; Chile 40.
Ferronickel	200	121	--	All from Japan.
Ferrosilicon	4,024	3,868	1	Canada 2,084; Italy 326; Norway 307.
Unspecified	837	984	131	Japan 552; France 122; United Kingdom 100.
Steel, primary forms thousand tons	1,211	396	1	Japan 269; Australia 80.
Lead:				
Oxides	179	91	12	Mexico 68; Japan 11.
Metal including alloys:				
Scrap	4,301	5,704	4,314	Canada 416; Oman 305; Saudi Arabia 278.
Unwrought	40,156	227,136	1,208	Taiwan 208,914; Peru 7,533; Australia 5,552.
Magnesium: Metal including alloys, all forms	405	416	276	Norway 68; Japan 55.
Manganese:				
Ore and concentrate:				
Battery-grade	3,389	3,907	--	Singapore 3,312; Japan 559.
Metallurgical-grade	278,626	232,678	NA	India 95,204; Australia 71,197; Gabon 44,978.
Oxides	1,202	1,536	NA	Japan 1,469.
Mercury 76-pound flasks	657	554	8	Japan 532.
Molybdenum: Metal including alloys, all forms	7	11	1	Japan 8.
Nickel:				
Oxides and hydroxides	89	23	--	Canada 17; Japan 6.
Metal including alloys, all forms	4,403	3,660	979	Canada 1,408; Japan 316; Philippines 200.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	[r]39,906	26,659	4,363	Japan 10,241; West Germany 8,607; United Kingdom 1,526.

See footnotes at end of table.

Table 3.—Republic of Korea: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources	
			United States	Other (principal)
METALS —Continued				
Selenium, elemental ---- troy ounces--	5	5	--	Japan 4.
Silicon, high-purity	313	652	(2)	Norway 209; France 120; Portugal 64.
Silver:				
Waste and sweepings - troy ounces--	21,960	29,042	--	All from Japan.
Metal including alloys, unwrought and partly wrought ----- do----	^{r}159,307	164,997	28,421	Japan 95,230; Singapore 34,401; United Kingdom 5,016.
Tin:				
Ore and concentrate	151	17	--	All from Singapore.
Metal including alloys:				
Unwrought including scrap	2,057	2,093	13	Malaysia 1,129; Indonesia 546; Thailand 154.
Semimanufactures	^{r}66	30	(2)	Japan 11; Hong Kong 10; Denmark 5.
Titanium:				
Ore and concentrate	26,028	33,455	--	Malaysia 26,263; Australia 4,798; India 2,288.
Oxides	4,309	2,950	26	Japan 1,925; West Germany 897; Spain 64.
Metal including alloys, all forms	931	391	363	Japan 27.
Tungsten: Metal including alloys, all forms	19	31	4	Japan 13.
Uranium and/or thorium: Metal including alloys, all forms, uranium	110	37	37	
Zinc:				
Ore and concentrate	90,323	79,176	--	Australia 76,034; Peru 3,142.
Oxides	192	146	67	Japan 57; West Germany 22.
Blue powder	167	15	1	Japan 7; Netherlands 6.
Ash and residue containing zinc	29	153	--	All from Saudi Arabia.
Metal including alloys:				
Scrap	10,146	9,252	308	Japan 5,913; Australia 2,150; Netherlands 220.
Unwrought	2,072	1,568	599	Japan 830; Australia 139.
Zirconium: Ore and concentrate	3,123	2,370	--	Australia 1,918; Malaysia 414.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	628	1,237	251	Japan 597; India 384.
Artificial:				
Corundum	11,048	11,211	45	Japan 8,557; Hong Kong 377; Austria 361.
Silicon carbide	4,423	3,918	2	Japan 3,107; West Germany 344; Switzerland 108.
Asbestos, crude	53,787	44,038	3,446	Canada 7,032; Japan 405.
Barite and witherite	200	350	--	All from Thailand.
Boron materials:				
Crude natural borates	497	570	--	All from Japan.
Oxides and acids	1,406	2,024	868	Italy 252; United Kingdom 105; Japan 67.
Bromine	100	154	17	Ireland 8; Japan 2.
Chalk	505	19	--	Mainly from France.
Clays, crude	97,604	166,116	29,238	Japan 120,900; Hong Kong 14,150.
Cryolite and chiolite	--	100	--	All from Japan.
Diamond:				
Natural:				
Gem, not set or strung value, thousands--	$1,667	$1,016	--	Japan $585; Belgium-Luxembourg $212; Hong Kong $169.
Industrial ---------do----	$731	$690	$603	Japan $45; United Kingdom $33.
Unsorted ---------do----	$95	$20	$20	
Synthetic stones ----- kilograms--	(3)	14,852	14,093	Switzerland 309; Hong Kong 230.
Diatomite and other infusorial earth	49	82	61	Japan 17; United Kingdom 4.
Feldspar	18	39	--	All from Japan.
Fertilizer materials: Manufactured:				
Nitrogenous	^{r}3,734	582	--	Chile 335; Japan 202.
Potassic	269,577	390,167	21,409	Canada 339,559; Belgium-Luxembourg 20,381; Taiwan 4,400.
Unspecified and mixed	27	83,879	83,870	Japan 6.
Fluorspar	23,128	18,352	--	Thailand 18,334.
Graphite, natural	205	453	1	Japan 258; India 172.
Gypsum and plaster	741	17,337	35	Australia 15,202; Japan 2,100.
Magnesium compounds:				
Magnesite	7,346	7,575	--	Japan 7,538.
Oxides and hydroxides	^{r}10,384	18,400	5	Japan 8,356.

See footnotes at end of table.

Table 3.—Republic of Korea: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources	
			United States	Other (principal)
NONMETALS —Continued				
Mica:				
Crude including splittings and waste	122	185	76	India 56; United Kingdom 23; Malaysia 18.
Worked including agglomerated splittings	104	150	5	Switzerland 87; Japan 40; West Germany 18.
Nitrates, crude	2,052	1,260	NA	Chile 1,134; West Germany 18.
Phosphates, crude thousand tons	1,137	1,505	1,450	Australia 32; Nauru 18.
Phosphorus, elemental	1,356	1,309	802	West Germany 25; Japan 24.
Precious and semiprecious stones other than diamond:				
Natural[4] kilograms	87,061	54,418	1,244	Brazil 26,405; Japan 26,381.
Synthetic do.	35,219	22,923	14,220	Japan 6,530; Belgium-Luxembourg 2,128.
Salt and brine	970,242	662,062	100	Australia 499,932; Japan 100,085; Yemen (Sanaa) 49,072.
Sodium compounds, n.e.s:				
Carbonate, manufactured	--	12,973	3,502	Austria 5,463.
Sulfate, manufactured	3,281	3,928	644	Taiwan 1,316; Austria 900; West Germany 771.
Sulfur:				
Elemental:				
Crude including native and byproduct	386,430	440,660	5,065	Japan 237,130; Canada 197,865.
Colloidal, precipitated, sublimed	322	368	104	Japan 251.
Sulfuric acid	143	133,890	66	Japan 133,823.
Talc, steatite, soapstone, pyrophyllite	1,789	12,486	74	Taiwan 5,220; Japan 718.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	636	47	38	Japan 9.
Carbon: Carbon black	14,858	4,134	1,485	Japan 1,418; Canada 695; Australia 378.
Coal:				
Anthracite thousand tons	^{r}5,138	2,449	686	Japan 410; Hong Kong 72; Taiwan 19.
Bituminous do.	7,245	9,039	1,319	Australia 3,859; Canada 2,205.
Briquets of anthracite and bituminous coal	^{r}189,426	23,578	NA	Australia 18,652.
Lignite briquets	6,012	--		
Coke and semicoke	182,551	152,461	4,902	Japan 130,482; Taiwan 7,237.
Petroleum, crude thousand 42-gallon barrels	175,964	179,286	5	Saudi Arabia 90,130; Kuwait 22,582; Indonesia 15,006.

^{r}Revised. NA Not available.

[1] Table prepared by Audrey D. Wilkes.

[2] Less than 1/2 unit.

[3] Unreported quantity valued at $35,233.

[4] Totals exclude unreported quantities valued at $100,800 in 1981 and $183,200 in 1982.

COMMODITY REVIEW

METALS

Because of the country's dependence on foreign raw materials, South Korean enterprises obtain minerals and fuels under long-term contracts or through direct project participation to secure economic stability. The following tabulation illustrates South Korean dependence on overseas resources as estimated by various South Korean organizations, in thousand metric tons except as noted:

Commodity	Demand			Imports secured by contract		
	1983	1984	1985	1983	1984	1985
Copper ore	440	440	440	437	412	302
Iron ore	11,820	12,611	11,270	13,370	14,070	13,140
Manganese ore	280	300	300	280	300	300
Lead ore	29	127	148	--	96	116
Zinc ore	193	193	193	59	55	54
Phosphate	1,700	1,700	1,700	1,700	1,700	1,700
Asbestos	52	52	55	37	37	40
Coking coal	6,200	6,821	6,258	7,920	7,050	5,650
Steam coal for power generation	1,657	5,122	5,813	2,263	3,813	4,300
Steam coal for industrial use	3,030	3,440	3,850	950	1,250	1,250
Anthracite	22,461	22,918	23,568	1,419	--	2,552
Uranium (U_3O_8) tons	557	786	1,158	437	785	1,175

The Republic of Korea is self-sufficient in carbonate minerals (dolomite and limestone), construction aggregate, molybdenum, and tungsten. However, the Republic of Korea imports 100% of its requirements for aluminum, manganese, and petroleum, and close to 100% for copper and iron.

Aluminum.—Aluminium of Korea Ltd. operates the only refinery in the country, a 17,000-ton-per-year plant at Ulsan. All of the refinery's requirements for alumina are imported from Japan. Kukje Corp. planned to construct a $900 million aluminum smelter in Perth, Australia, in a joint venture with an Australian firm. Construction of the 220,000-ton-per-year smelter was expected to start in 1986. Under the proposed contract, one-half of the smelter output was to be exported to the Republic of Korea.

Copper.—There are two copper refineries in the Republic of Korea: Korea Mining & Smelter Co. Ltd. at Changhang with an annual metal capacity of 40,000 tons and Onsan Copper Refinery Co. Ltd. at Onsan with an annual capacity of 80,000 tons. Copper consumption in 1978 was 15,000 tons. Consumption doubled in 1979 to 33,000 tons, almost doubled again in 1980 to 59,000 tons, and then reached the 100,000-ton level in 1981-82. Estimated consumption in 1983 was 160,000 tons. Domestic mine production contributed less than 1% of copper demand. There was no duty on imports of ores and concentrates; however, the Government was considering a 1% duty beginning July 1, 1984. Duty on other copper products ranged from 5% ad valorem on matte, to 10% for waste and scrap, to 20% for unwrought metal.

Iron and Steel.—Pohang Iron and Steel Co. Ltd. (Posco), a state-run enterprise, operates the only integrated iron and steel complex in the Republic of Korea. Posco's annual capacity grew from 1 million tons in 1973, to 2.6 million tons in 1976, to 5.5 million tons in 1978, to 8.1 million tons in 1981, and reached 9 million tons in 1983 with the installation of the fourth blast furnace on May 26. In 1982, Posco had gone from the 19th to the 12th largest steelmaker in the world. In terms of national aggregate, South Korean steelmaking capacity increased from 911,000 tons to 13 million tons during the past decade.

According to Wheeling-Pittsburgh Steel Corp., Posco is the world's lowest cost steel producer and will continue to be so for the next 20 years.[6] The price of Posco's steel was estimated at $420 per ton compared with $670 for Japanese steel. In addition, Posco was running at full capacity and its output of hot-rolled and cold-rolled steel was fully committed to buyers throughout 1983.

After the completion of its expansion program of its complex on the southeast coast, Posco embarked on the construction of a second integrated complex, a 2.7-million-ton-per-year facility at Kwangyang, at the southern edges of the peninsula in Cholla-Namdo. An estimated $2.3 billion was needed to transform 14.85 million square meters of the poor fishing village at Kwangyang into the country's second integrated facility, which would produce high-quality specialty steel products and demand products made to customer specifications. The village of Kwangyang was paid $38 million in compensation for 2 million square meters. The remainder of the land, 12.85 million square meters, was being reclaimed in an elaborate landfill project.

The Thyssen Group of the Federal Republic of Germany is the consultant for the Kwangyang master engineering plan, which will feature 100% continuous casting and will comprise 22 plants including coke, ironmaking, steel, continuous casting, and hot-strip rolling. Infrastructure will include bridges, two industrial highways, and a port with three berths for ships of up to 250,000 tons. Completion of phase 1 construction was planned for March 1988. Depending on demand, a second-phase construction program would double Kwangyang's capacity to 5.4 million tons.

Posco invited international bids to furnish steelworks equipment and to submit price estimates by October 15, 1983. By mid-November, Posco began awarding contracts. Davy McKee Ltd. (United Kingdom) was to supply a 13.2-meter-diameter hearth blast furnace; Voest-Alpine AG (Austria), a sinter plant and two steel converters; Mannesmann Demag AG (Federal Republic of Germany), a continuous-casting plant; Mitsubishi Heavy Industries Ltd. (Japan), a hot-strip mill.

Despite opposition by the U.S. Department of Commerce, the Export-Import Bank of the United States approved a preliminary commitment offering financial guarantees of commercial loans to support bids by two U.S. companies for the Kwangyang steelworks. Dravo Wellman Co. of Pittsburgh, Pennsylvania, was bidding on a raw materials handling plant and a central terminal system. Air Products and Chemicals Inc. was bidding on air separation units for two oxygen plants.

NONMETALS

Cement.—Korea's annual production capacity for cement is 23.1 million tons. Production in 1983 was at 92% of rated capacity. Domestic shipments totaled about 17.9 million tons compared with exports of 2.2 million tons. Because of slack demand, both domestically and in the export market, Hall Cement Co. suspended construction of its 1-million-ton-per-year plant at Okke, Kangwon-do, in 1980. Because of the recovery in the country's construction industry, Hall Cement was expected to resume construction of the Okke plant in 1984.

Fertilizer Materials.—The Republic of Korea's competitiveness for fertilizer production is severely limited inasmuch as its industry imports all of its requirements for phosphate, potash, and natural gas for naphtha feedstock. Production in 1983 was 2.4 million tons compared with peak production of 3 million tons in 1979. Because of the weak economic situation of the domestic fertilizer industry, the Government proposed limiting production of fertilizers to an annual level of 2.17 million tons by closing the Chinhae fertilizer plant and reducing the output of Yong-Nam Chemical Co. Ltd. by 50%. Shipments of fertilizers in 1983, compared with a total production of 2.4 million tons, were as follows, in thousand tons: nitrogenous fertilizers, 692; fused phosphate, 37; and complex fertilizers, 1,629.

MINERAL FUELS

Although the Republic of Korea produced close to 19 million tons of anthracite coal in 1983, the country was a net importer of fuels (coal, oil, and natural gas). To meet the shortfall in demand, the Government actively encouraged domestic companies to develop foreign fuel resources. Posco, the state-run iron and steel enterprise, was involved in securing coal resources in the United States (Tanoma, Pennsylvania), Australia (Mt. Thorley), and Canada (Greenhills). For steam coal, Hyundai Corp. and Dae Sung San Up Corp. were developing coal resources in Australia; Korea Hapsum Co., in Indonesia; and Sun Eel Co., in Alaska. Moreover, to limit further its dependence on imports of foreign energy, South Korean companies pursued direct participation in drilling for delineating energy resources for coal in Indonesia (Korea-Alaska Development Co.), and uranium in Paraguay and Gabon (Korea Electric Power Corp. Ltd).

Furthermore, to reduce dependence on crude oil imports, the Government has pursued electric energy development via nuclear power generation. Electric power generation was to increase from 49.1 to 65.1 billion kilowatt hours under the Government energy development program as follows, in percent:

	1983	1986
Hydropower	5.2	3.9
Oil-fired	66.1	31.6
Bituminous	2.9	22.7
Anthracite	7.6	5.1
Nuclear	18.2	33.5
Liquefied natural gas	--	3.2
Total	100.0	100.0

Also, as part of its energy plan, the Government signed a long-term liquefied natural gas supply contract with Indonesia in August 1983, which will provide 2 million tons per year for 20 years (1987-2006).

Hando Ltd. plans to begin mining coal in 1986 from a newly discovered coal deposit in Samchoh, Kangwon-do. The deposit has estimated reserves of 52.6 million tons of high-quality anthracite existing in veins ranging from 2.2 to 12 meters in thickness from 430 meters to 1.1 kilometers below the surface. Planned mine capacity was rated at 1 million tons per year upon completion of construction in late 1986.

During 1983, Texaco Korea Inc. and Korean-American Oil Co. continued seismic studies for oil offshore. Moreover, 11 offshore drillings in the southern peninsula since 1981 resulted in no commercial finds for oil. The one well drilled in 1983 by Zapata Exploration Co. was dry. However, the Government planned to drill 13 exploratory wells by 1987.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Korean won (W) to U.S. dollars at the rate of W749.3= US$1.00 for 1982 and W796.3=US$1.00 for 1983.

[3] Economic Planning Board. Monthly Statistics of Korea (Seoul). V. 2, 1984, 175 pp.

[4] U.S. Embassy, Seoul, Republic of Korea. Foreign Economic Trends for Korea. State Dep. Airgram A-49, Oct. 14, 1983, 11 pp.

[5] ———. Korea's Overseas Resource Base Development. State Dep. Airgram A-46, Sept. 8, 1983, 7 pp.

[6] American Metal Market. V. 91, No. 92, May 11, 1983, p. 5.

The Mineral Industry of Kuwait

By Peter J. Clarke[1]

Kuwait's mineral industry consisted mainly of the production of petroleum and natural gas and their related downstream processing industries, including petroleum refining, the production of liquefied petroleum gas (LPG), and ammonia and urea fertilizer manufacturing. In addition to these primary industries, the Government petrochemical company operated a salt, chlorine, and acid plant, and local small operators produced cement, lime, sand-lime bricks, and lesser quantities of clay, stone, concrete, and other crude construction materials. Metal pipe for the oil industry was also produced domestically from imported iron and steel.

The production and processing of crude oil continued to be the mainstay of the economy, providing the revenues to develop its downstream industries, despite the generally weak level of world oil demand and the oversupply situation that persisted through most of 1983. Kuwait's oil industry managed a slight comeback from a comparatively bad year in 1982, but crude oil output remained at less than one-third of its 1972 peak of 3.3 million barrels per day, and still only 53% of its previous 10 year period average.

This comparatively low level of oil production was causing a problem considered more severe by the Kuwaitis than the general decline in oil revenues. The drop in oil output created a sharp decline in the production of associated gas, which was used throughout Kuwait as feedstock for its LPG and ammonia-urea fertilizer facilities, and as fuel for its water desalinization plants and power generating stations. These facilities were forced to operate well below capacity, resulting in reduced export revenues from these high value-added products.

With it's crude oil production ceiling holding at 1.05 million barrels per day, Kuwait took the unusual step of announcing its intention to import liquefied natural gas (LNG) from either Abu Dhabi, Algeria, or Libya to meet its energy requirements. Kuwait's critical gas needs were to be partly satisfied in the future by the Southern Gas Project, designed to collect previously flared associated gas from Kuwait's share of the Kuwait-Saudi Arabia Divided Zone oil output. Coupled with this project was an intensive effort by the Government-owned Kuwait Petroleum Corp. (KPC) to explore for reserves of nonassociated gas that is so abundant in other areas of the Persian Gulf. Through 1983, these efforts have been largely unsuccessful.

Domestically, KPC, through its subsidiary companies, was expanding petroleum refining capacity from 450,000 to 510,000 barrels per day, constructing a new salt and chlorine producing complex, and implementing the massive Southern Gas Project.

In the international arena, KPC's foreign investments prior to 1983 included the purchase of Sante Fe International Corp. of the United States and its C. F. Braun and Co. engineering subsidiary for $2.5 billion;[2] the subsequent purchase of Andover Oil Co. of Tulsa, OK; ownership of 29% of International Energy Development Corp. BV (IEDC), a Swiss-based holding company with shares in 100 million acres of oil and gas rights worldwide; a 24.5% stake in the West German petrochemical manufacturer Hoechst AG; 22% of Metallgesellschaft AG of the Federal Republic of Germany; and a joint venture with AZL Resources Inc. of the United States. In 1983, KPC completed its acquisition of Gulf Oil Co.'s (United States) refining and marketing interests in the Netherlands, Belgium, Luxembourg, Denmark, and Sweden, which included the purchase of Gulf's 75,000-barrel-per-day refinery in Rotterdam and its 85,000-barrel-per-day refinery in Gulfhavn, Denmark, along with 850 gas stations in the two countries, 2 lube oil blending plants and 8 terminals in Denmark, and a 50% share in 30 terminals in Sweden. KPC also acquired Gulf's 75% share in the 80,000-barrel-per-day Sarni refinery near Milan, Italy, which was closed, along with 1,500 gas stations, aviation fuel outlets, and terminals in Italy.

In August, Santa Fe paid $4.4 million for a share, along with the Saxon Group of the United Kingdom, in a British North Sea license area, and it also purchased a share in the producing Thistle Field. Kuwait then acquired the United Kingdom-based Pace Petroleum Ltd. through an existing United Kingdom-based subsidiary, Hays Group Ltd. Pace supplied 250 gas stations in the United Kingdom and operated a fleet of road tankers. In August, KPC set up a new subsidiary, Kuwait Petroleum International in the United Kingdom to manage its European and Scandinavian refining and marketing operations, and to undertake new investments in that region.

Also during the year, Kuwait, through KPC's Santa Fe subsidiary, applied for, and was subsequently denied, leasing rights on U.S. federally owned lands for oil, gas, and other minerals under the Mineral Lands Leasing Act of 1920. The decision by the U.S. Department of the Interior not to grant Kuwait reciprocity under the act was made based on Kuwait's nationalization of U.S. oil interests in that country in the 1970's.[3]

Despite the increase in crude oil production, Government revenues from oil and gas sales remained at about the same level as those of 1982, approximately $9.5 billion, mostly as a result of the March 1983 "London Agreement" of the Organization of Petroleum Exporting Countries (OPEC), which lowered the price of the OPEC benchmark crude from $34 to $29 per barrel. Total oil and gas revenues to the Government, which include not only sales but also oil company corporate profits tax and royalties, amounted to approximately $11 billion, which comprised 92.5% of Kuwait's official revenues. Even with the decline in oil revenues from over $17 billion in 1981 to under $10 billion in 1983, Kuwait's investments overseas have allowed the country to maintain its position as having one of the world's highest per capita incomes, estimated at over $20,000, while adding to its official financial reserves, estimated at $72 billion at the start of 1983.[4]

PRODUCTION AND TRADE

Crude oil production in Kuwait rose over 28%, from an average 822,540 barrels per day in 1982, to 1.05 million barrels per day in 1983. Installed crude oil production capacity was significantly higher at about 3.5 million barrels per day. The low production level was maintained during the year in accordance with OPEC's overall ceiling of 17.5 million barrels per day, Kuwait's share of which was limited to 1.05 million barrels per day. Associated gas production was also up from that of 1982 but remained far below capacity and critically short of domestic demand.

Less than 40% of Kuwait's crude oil was exported under contract and spot market sales; the majority being refined domestically, traded in swap deals or on other accounts, or shipped overseas for refining by KPC subsidiaries. Refinery production continued to increase and reached its alltime peak level of nearly 159 million barrels, as Kuwait directed more of its oil to domestic refineries than ever before. Production of LPG rebounded somewhat in 1983 to above 20 million barrels, but remained at less than 50% capacity because of the shortage of natural gas feedstock. The same was true of ammonia and urea production, where capacity utilization remained below 50%. Nonfuel mineral production, notably cement, caustic soda, lime, salt, and sulfur, increased only slightly.

The low level of oil production in 1982 and 1983 has not severely affected Kuwait's external trade position. Total exports in 1983 reached nearly $11 billion, with sales of crude oil and refined products comprising just over 81% of the total, with LPG, fertilizer materials, and other manufactured products making up the remainder.[5] Kuwait's balance of payments continued to run a surplus as it has since 1979, but the current account surplus has fallen from over $4.3 billion in 1980 to below $1.8 billion.

Kuwait's exports of crude oil averaged 404,560 barrels per day in 1983, considerably higher than that of 1982, while exports of refined products topped 386,300 barrels-per day. The export value of refined products exceeded that of crude oil exports in 1983 for the first year ever, establishing a trend that was expected to continue into the future as Kuwait's refineries are expanded. Crude oil was exported primarily to China, the Republic of Korea, Japan, the United States, Turkey, and Yemen (Aden). Exports of LPG rose to over 15 million barrels of propane and butane, most of which went to Japan, Turkey, and the Netherlands. The United States ran a surplus in its trade account with Kuwait, exporting goods worth $741 million and importing petroleum worth only $130 million.[6]

Table 1.—Kuwait: Production of mineral commodities[1]

Commodity	1979	1980	1981	1982[p]	1983[e]
Cement thousand metric tons	1,040	1,307	1,549	1,553	1,560
Clay products, nonrefractory: Sand-lime bricks cubic meters	357,777	338,128	293,682	419,000	450,000
Gas, natural:[2]					
Gross million cubic feet	460,376	310,066	223,525	162,728	221,500
Marketed do	334,371	260,039	196,352	145,853	199,000
Lime: Hydrated and quicklime metric tons	5,634	17,738	21,598	10,200	14,000
Natural gas liquids:					
Natural gasoline thousand 42-gallon barrels	9,875	[r]7,462	5,463	3,914	4,400
Butane do	14,579	10,904	6,976	5,060	6,800
Propane do	21,879	17,381	9,564	4,938	9,000
Total do	46,333	[r]35,747	22,003	13,912	20,200
Nitrogen: N content of ammonia metric tons	304,556	214,456	213,330	183,000	234,000
Petroleum:					
Crude[2] thousand 42-gallon barrels	[r]911,208	[r]607,268	411,174	300,220	384,888
Refinery products:					
Gasoline, motor do	8,834	7,947	8,255	10,196	11,000
Jet fuel do	6,931	4,175	5,788	6,346	7,000
Kerosine do	11,979	11,110	7,451	7,694	8,100
Distillate fuel oil[3] do	30,867	27,516	23,822	63,200	64,500
Gas oil do	66,095	53,109	41,749	40,044	41,600
Naphtha do	23,033	17,045	13,116	22,137	22,800
Asphalt do	963	1,181	1,526	1,237	1,300
Unspecified do	1,918	1,075	749	2,600	2,700
Total do	150,620	123,158	102,456	153,454	159,000
Salt metric tons	19,670	20,498	18,663	19,300	20,000
Sodium and potassium compounds: Caustic soda do	9,219	9,111	8,900	8,700	9,000
Sulfur:					
Elemental, petroleum byproduct do	100,000	120,000	97,000	140,644	145,000
Sulfuric acid do	NA	NA	4,759	8,900	15,000

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through June 1, 1984.

[2] Includes Kuwait's share of production in the Kuwait-Saudi Arabia Divided Zone.

[3] Includes diesel oil.

Table 2.—Kuwait: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1980	1981	Destinations, 1981	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, semimanufactures	1,699	486	--	Syria 150; Saudi Arabia 115; Iraq 79.
Copper: Metal including alloys, all forms	532	178	--	Iran 100; Saudi Arabia 46; Iraq 20.
Iron and steel: Metal:				
Scrap	62,200	24,691	--	India 7,225; Syria 7,089; Qatar 5,573.
Pig iron, cast iron, related materials	--	131	--	Saudi Arabia 75; Iraq 56.
Semimanufactures:				
Bars, rods, angles, shapes, sections	41,377	151,796	--	Iraq 140,551; Saudi Arabia 8,498; Jordan 2,165.
Universals, plates, sheets	8,599	12,185	--	Iraq 7,808; Saudi Arabia 3,793; Jordan 344.
Wire	431	1,952	--	Iraq 1,774; Saudi Arabia 55; Qatar 17.
Tubes, pipes, fittings	19,173	43,890	9	Iraq 35,418; Saudi Arabia 5,728; Jordan 530.
Lead: Metal including alloys, all forms	696	91	--	Saudi Arabia 69; Iraq 20.
Uranium and thorium: Metal including alloys, all forms value, thousands	$5	$2	--	All to United Kingdom.
Zinc: Metal including alloys, semimanufactures	90	56	--	Saudi Arabia 39; Iraq 17.
Other:				
Oxides and hydroxides	6	--		
Base metals including alloys, all forms	33,947	12	--	All to Iraq.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	49	34	--	Saudi Arabia 17.
Asbestos, crude	6	1,315	--	All to Iraq.
Cement	278,041	928,512	--	Iraq 916,403; Saudi Arabia 11,611.
Clays, crude: Unspecified	13,913	34,486	--	Iraq 33,163; Syria 616.
Diamond: Gem, not set or strung value, thousands	--	$133	--	All to India.
Fertilizer materials:				
Crude, n.e.s	112	69	2	Saudi Arabia 67.
Manufactured:				
Ammonia	48,888	70,884	--	India 28,273; Turkey 17,817; Philippines 15,777.
Nitrogenous	391,812	170,880	--	India 79,734; Iran 39,764; Iraq 21,871.
Unspecified and mixed	331	--		
Graphite, natural	--	2	--	All to Saudi Arabia.
Gypsum and plaster	52	161	--	Saudi Arabia 102; Iraq 59.
Lime	626	2,684	--	Iraq 2,503; Saudi Arabia 177.
Salt and brine	1,854	2,064	--	Iraq 2,017; Saudi Arabia 38.
Sodium compounds, n.e.s.:				
Carbonate, natural and manufactured	156	--		
Sulfate, natural and manufactured	--	7,024	--	Iraq 6,107; Saudi Arabia 422; Jordan 265.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	169	65	--	Saudi Arabia 63; Iraq 2.
Worked	1,812	1,095	--	Saudi Arabia 532; Iraq 348; Bahrain 198.
Gravel and crushed rock	1,923	2,861	--	Saudi Arabia 2,538; Iraq 276; Lebanon 47.
Sand other than metal-bearing	40	11	--	All to Iraq.
Sulfur:				
Elemental, colloidal, precipitated, sublimed	240,380	127,285	--	India 96,077; Pakistan 29,784.
Sulfuric acid	1,929	167	--	Iraq 129; Saudi Arabia 38.
Other: Crude	4,396	133	--	Iraq 90; Saudi Arabia 42.
MINERAL FUELS AND RELATED MATERIALS				
Coal: All grades including briquets and coke	21	98	--	Saudi Arabia 86; Jordan 10.

See footnotes at end of table.

Table 2.—Kuwait: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1980	1981	Destinations, 1981	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum:				
Crude ____ thousand 42-gallon barrels__	474,731	314,222	--	Japan 88,603; Republic of Korea 36,097; Singapore 34,975.
Refinery products:				
Liquefied petroleum gas ____do____	25,124	18,538	--	Japan 15,966; Turkey 1,120; Iraq 720.
Gasoline, motor ________do____	1,523	279	--	Pakistan 162; Sudan 91.
Kerosine and jet fuel ______do____	28,830	23,739	--	Philippines 6,799; Japan 3,980; Singapore 2,941; Indonesia 2,900.
Distillate fuel oil ________do____	25,018	20,791	--	Pakistan 7,550; India 3,012; Indonesia 2,612; West Germany 1,660.
Lubricants ___________do____	21	39	([2])	Iraq 10; Saudi Arabia 10; Iran 4.
Residual fuel oil _________do____	41,811	41,231	--	Australia 8,572; Philippines 4,913; Italy 3,729; Singapore 1,848.
Bitumen and other residues___do____	9	145	--	United Arab Emirates 133; Saudi Arabia 7.

[1] Table prepared by Virginia A. Woodson.
[2] Less than 1/2 unit.

Table 3.—Kuwait: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1980	1981	Sources, 1981	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, semimanufactures ________________	16,489	15,547	407	Norway 3,323; France 1,986; Bahrain 1,917; Republic of Korea 1,719.
Copper: Metal including alloys, all forms ___	3,011	3,546	314	United Kingdom 1,732; Japan 870; West Germany 173.
Iron and steel: Metal:				
Scrap______________________	1,182	1,595	4	Saudi Arabia 857; Republic of Korea 550.
Pig iron, cast iron, related materials ____	525	900	--	India 505; Japan 193; France 66.
Semimanufactures:				
Bars, rods, angles, shapes, sections __	381,221	498,287	196	Japan 332,074; Republic of Korea 55,202; China 26,979.
Universals, plates, sheets ________	141,967	138,327	1,160	Japan 98,085; Republic of Korea 13,263; Belgium-Luxembourg 12,664.
Wire ___________________	17,902	17,558	103	France 4,661; Japan 4,429; West Germany 3,149.
Tubes, pipes, fittings __________	102,730	149,246	1,396	Japan 61,256; West Germany 19,374; United Kingdom 19,256.
Lead: Metal including alloys, all forms_____	2,749	546	20	United Kingdom 347; Yugoslavia 121; West Germany 16.
Nickel: Metal including alloys, all forms____	1	3	--	All from United Kingdom.
Silver: Metal including alloys, unwrought and partly wrought __ value, thousands__	--	$18	--	All from Switzerland.
Tin: Metal including alloys, all forms _____	1	3	--	All from United Kingdom.
Uranium and thorium: Metal including alloys, all forms ____ value, thousands__	$98	$182	$58	United Kingdom $109; West Germany $15.
Zinc: Metal including alloys, semimanufactures ________________	109	576	--	West Germany 540.
Other:				
Oxides and hydroxides ___________	433	--		
Base metals including alloys, all forms___	15,359	99	1	Italy 64; West Germany 32.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones ______________	503	855	1	Italy 647; Czechoslovakia 30; United Kingdom 28.
Asbestos, crude __________________	2,084	2,018	--	NA.

See footnotes at end of table.

Table 3.—Kuwait: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1980	1981	Sources, 1981	
			United States	Other (principal)
NONMETALS —Continued				
Cement thousand tons	2,887	2,303	66	Japan 1,599; Spain 170; U.S.S.R. 110; France 67.
Clays, crude: Unspecified	58,681	39,722	83	India 39,432.
Diamond: Gem, not set or strung value, thousands	$1,036	$1,731	$9	Belgium-Luxembourg $1,036; India $521; Sierra Leone $120.
Fertilizer materials:				
Crude, n.e.s	--	849	--	Yugoslavia 600; Italy 234.
Manufactured:				
Ammonia	53	140	5	Netherlands 63; United Kingdom 28; Japan 24.
Nitrogenous	--	18	--	All from Italy.
Unspecified and mixed	666	285	2	West Germany 115; Belgium-Luxembourg 90.
Graphite, natural	--	263	--	United Kingdom 200; Italy 63.
Gypsum and plaster	25,380	25,127	49	Saudi Arabia 19,508; Iraq 3,278; Cyprus 1,500.
Lime	22,112	1,279	104	Lebanon 472; United Arab Emirates 400; Iraq 120.
Pigments, mineral: Iron oxides and hydroxides, processed	--	846	32	Philippines 332; West Germany 114; Belgium-Luxembourg 113.
Precious and semiprecious stones other than diamond: Natural value, thousands	$1,325	$469	--	Belgium-Luxembourg $307; India $106.
Salt and brine	37,134	13,606	662	Saudi Arabia 5,044; Egypt 3,001; Netherlands 2,102; China 1,066.
Sodium compounds, n.e.s.:				
Carbonate, natural and manufactured	--	99	--	Belgium-Luxembourg 50; China 40.
Sulfate, natural and manufactured	--	26	1	Saudi Arabia 25.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	203,260	117,083	99	Saudi Arabia 110,530; Italy 2,689; Jordan 1,391.
Worked	131,292	118,917	143	Italy 56,150; Jordan 47,326; Greece 7,416.
Gravel and crushed rock	174,907	172,416	47	Italy 82,053; Syria 34,097; Saudi Arabia 23,622.
Sand other than metal-bearing	1,501	9,821	27	Jordan 7,757; Norway 1,390.
Sulfur:				
Elemental, collodial, precipitated, sublimed	--	186	--	Sweden 110; Czechoslovakia 27; China 26.
Sulfuric acid	17	4	--	Denmark 3; United Kingdom 1.
Other: Crude	6,023	22,982	226	Australia 17,892; Jordan 1,834; Netherlands 1,215.
MINERAL FUELS AND RELATED MATERIALS				
Coal: All grades including briquets	--	302	182	West Germany 50; United Kingdom 27; Poland 26.
Petroleum refinery products:				
Gasoline, motor 42-gallon barrels	83,572	--		
Mineral jelly and wax do.	102	23	--	Japan 8; United Kingdom 8.
Kerosine and jet fuel do.	8,587	72,114	--	All from West Germany.
Distillate fuel oil do.	--	201	201	
Lubricants do.	237,377	208,971	32,214	United Kingdom 44,338; Singapore 21,882; United Arab Emirates 20,447.
Residual fuel oil do.	263,723	--		
Bitumen and other residues do.	2,594	2,098	209	West Germany 1,085; Belgium-Luxembourg 466; Italy 314.
Bituminous mixtures do.	23,428	75,873	52,895	United Kingdom 12,173; West Germany 4,687.

NA Not available.

[1] Table prepared by Virgina A. Woodson.

COMMODITY REVIEW

METALS

Kuwait did not produce any raw metals, nor were there any known metalliferous deposits in the country. The only significant domestic metal-working industries in Kuwait were the Arab Light Metal Industries Co., which produced aluminum manufactured goods from imported aluminum metal, and the Kuwait Metal Pipe Industry, which operated a 100,000-ton-per-year spiral-weld pipe mill that produced pipe for the petroleum industry from imported iron and steel scrap. Kuwait's holdings in foreign metal industries included 22% of Metallgesellschaft, 30% of Korf Stahl AG, both of the Federal Republic of Germany; 28% of the equity of Spain's Prereducidos del Suroeste de España S.A. direct-reduction iron plant; part ownership of the Arab Iron and Steel Co.'s 4-million-ton-per-year iron ore pelletizing plant under construction in Bahrain, and a 20% share, based on its participation in the Gulf Cooperation Council, in the planned Gulf Aluminum Rolling Mill Co., also to be built in Bahrain.

NONMETALS

Cement.—Production of cement from the Kuwait Cement Co. remained at about the same level as in the previous 2 years, about 1.5 million tons. Cement was produced from imported gypsum and imported and domestically produced lime. In addition to cement, Kuwait also produced approximately 450,000 cubic meters of sand-lime bricks, 1.8 million cubic meters of concrete slabs, 85,000 cubic meters of ready-mix concrete, and 52,000 tons of concrete pipe, all from small-scale domestic industries. Consumption of cement in Kuwait averaged 4 million tons per year, part of which was to be supplied by a joint Saudi-Kuwaiti 2-million-ton-per-year cement plant under construction in Khursaniyah, Saudi Arabia.

Fertilizer Materials.—Kuwait Petrochemical Industries Co. (PIC), a subsidiary of KCP, was the sole producer of ammonia and urea fertilizer from its facility at Shuaiba. The plant produced at only 43% of its capacity of 543,000 tons of nitrogen in ammonia in 1983 owing to the shortage of natural gas feedstock. The plant consisted of three parallel ammonia production trains, each with a capacity of 220,000 tons per year, three urea plants with a total capacity of 702,000 tons per year, a 165,000-ton-per-year ammonium sulfate plant, and a 132,000-ton-per-year sulfuric acid plant. A fourth ammonia train, under construction by C. F. Braun utilizing Haldor Topsoe technology, was expected on-stream in 1984, raising total nitrogen capacity to 707,000 tons per year. In 1983, nearly all of the ammonia was used in the production of prilled urea, all of which was exported.

PIC announced plans for a joint venture with the Tunisian state-owned Industries Chimiques Maghrebines (ICM) to produce 1,000 tons per day of diammonium phosphate and 1,000 tons per day of nitrogen-phosphorus-potassium fertilizer at Shuaiba. The newly formed Arab Co. for Compound Fertilizers, owned 80% by PIC and 20% by ICM, commenced a preliminary study of the project in March. Phosphoric acid was to be supplied by Tunisia, ammonia was to be supplied by Kuwait's fourth ammonia train, and potash was to be imported. Completion of the $50 million project was tentatively scheduled for late 1985 or early 1986.

Sulfur.—Kuwait produced sulfur as a byproduct of petroleum refining and natural gas processing, a portion of which was consumed in the production of sulfuric acid at the PIC fertilizer plant at Shuaiba. In 1983, the Kuwait National Petroleum Co., the KPC subsidiary responsible for operating the country's petroleum refineries, awarded a $19 million contract to PHB Weserhutte AG of the Federal Republic of Germany for construction of a storage and conveying system for solidified sulfur at the Port of Shuaiba. The storage facility was to have a capacity of 54,000 tons of sulfur, and was being undertaken as part of the modernization program of the Mina al Ahmadi refinery.

MINERAL FUELS

Natural Gas.—Natural gas production averaged 607 million cubic feet per day, almost 90% of which was utilized either for industry, LPG production, or electricity generation.

KPC, through its oil producing subsidiary, Kuwait Oil Co. (KOC) was attempting to further increase gas utilization by collecting flared gas from the Divided Zone offshore oilfields, Kafji and Hout-Ratawi. KOC awarded a $220 million contract to Technip Geoproduction of France, Daewoo

Corp. of the Republic of Korea, and Raymond International of the United States for the design, engineering, and construction of the so-called Southern Gas Project. The gas was to be pipelined underwater from the offshore platforms to an onshore gas gathering and compression station, and then pipelined north to the LPG plant at Mina al Ahmadi for processing. The project was scheduled for completion in the fall of 1985.[7]

Meanwhile, KOC has allocated $140 million for exploration for nonasscociated gas. KOC had four rigs drilling to below 10,000 feet in search of deep gas from the Permian Khuff Formation, source of most of the Persian Gulf's nonassociated gas. Although none of these wells, including one drilled to a Middle East record of 22,000 feet, have encountered gas, most have discovered new reserves of oil.[8]

To make up for the shortage, KPC announced its intention to begin importing LPG around mid-1984. Kuwait Oil Tankers Co., another KPC subsidiary responsible for oil and gas tanker transportation, purchased a 125,000-cubic-meter LNG tanker from Algeria and began installing regasification equipment in Kuwait in anticipation of the gas imports. Abu Dhabi, Algeria, or Libya are likely sources of the gas.

Meanwhile, KPC's massive Shuaiba LPG plant continued to operate at less than 40% of its design capacity of 3.5 million tons per year of 60% propane and 40% butane. Only one of the plants three parallel production trains operated continuously during the year. Most of Kuwait's LPG was exported to Japan.

Petroleum.—*Production.*—Crude oil production was derived from onshore oilfields in Kuwait, where output averaged about 856,000 barrels per day, and from Kuwait's share of the Divided Zone, where oil was produced both onshore and offshore. Kuwait's share averaged 197,000 barrels per day. Crude production in Kuwait proper was controlled by KOC. Divided Zone production facilities offshore were operated by the Arabian Oil Co. (AOC), owned 60% by Saudi Arabia and 40% by Kuwait, and production was split according to equity between the two countries. Onshore production facilities in the Divided Zone were operated by KOC on behalf of Kuwait, and Getty Oil Co. (United States) on behalf of itself under a concession originally granted by Saudi Arabia in 1954. Production capacity from AOC's Kafji Field in the Divided Zone was to be expanded from 350,000 to 420,000 barrels per day through the installation of a 200,000-barrel-per-day desalting plant.

Exploration.—Exploration efforts in Kuwait centered mainly on finding deep nonassociated gas, but were far more successful in locating new reserves of oil. In addition to the four rigs drilling onshore deep test wells in 1983, Kuwait took delivery of its first offshore jackup rig, which began drilling in September in 300 feet of water 28 kilometers off the Ahmadi coast. Kuwait's proven crude oil reserves currently stand at 67.7 billion barrels, larger than any other country except the U.S.S.R. and Saudi Arabia.

The Kuwait Foreign Petroleum Exploration Co. (KUFPEC), a KPC subsidiary formed in 1981 to enter into joint ventures in petroleum exploration overseas, was also active in 1983. KUFPEC's holdings included: (1) a 50-50 joint venture for oil exploration with Solar Petroleum Co. (United States) in the Williston Basin in the United States; (2) 45% interest in a joint venture with Société Nationale Elf Aquitaine (France) and Société Cherifienne des Petroles (Morocco) in Morocco; (3) 21.25% of the IEDC Group (Switzerland); (4) 33% interest with Sumatra Gulf Oil Ltd. and PERTAMINA (Indonesian Government) in an exploration concession off the coast of Indonesia; and (5) new direct participation in joint oil exploration ventures in Oman and Sudan, purchased from IEDC.[9]

Refining.—Kuwait's three operating petroleum refineries processed approximately 159 million barrels of crude oil, an alltime high representing almost 100% of capacity. Kuwait has scaled back its plans to increase domestic refining capacity, from the original target of over 700,000 barrels per day to about 510,000 barrels per day, from its present level of 450,000 barrels per day. The reduction was a result of postponing the expansion of KNPC's Mina Abdullah refinery, whose current 140,000-barrel-per-day capacity was to be raised to 250,000 barrels per day under a contract already awarded to C. F. Braun. The delay was a result of reassessment of Kuwait's domestic refining needs in light of KPC's purchase of several European refineries. Expansion of KOC's Mina al Ahmadi refinery was proceeding as planned, with capacity being raised from 110,000 to 170,000 barrels per day under a contract to Japan Gasoline Corp. Completion of the expansion project was expected in 1984. Kuwait's third and newest refinery,

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at Shuaiba, operated near its capacity of 200,000 barrels per day in 1983. With Kuwait's domestic and foreign refineries fully integrated, KPC should be capable of processing over 85% of its crude oil production in its own refineries.

The Kuwait Lube Oil Co., a joint venture of the private Kuwait firm Rowaisat Co. and Austroplan of Austria, commenced construction of a 5,000-ton-per-year waste lube oil processing plant in Kuwait, the first of its kind in the area. The plant was designed to produce clean lube oil and low-sulfur gas oil from waste lube oil feedstock. The project was scheduled for completion in October 1984.[10]

Petrochemicals.—KPC, which owns 24.5% of the West German petrochemical manufacturer Hoechst, arranged supply agreements for ethylene and ammonia feedstock for the West German plant from PIC's ammonia plant in Kuwait and ethylene from independent suppliers in Europe. Kuwait also owns a one-third share in the Gulf Petrochemical Industries Co. (GPIC), along with Saudi Arabia and Bahrain. The Bahrain-based GPIC was constructing a $400 million petrochemical complex to produce 1,000 tons per day of ammonia and 1,000 tons per day of methanol. Snam Progetti S.p.A. of Italy was constructing the plant. Kuwait's PIC entered into a marketing agreement with GPIC to sell the latter's entire output of ammonia, presumably to KPC's European petrochemical interests. GPIC was designed to utilize Bahrain's output of natural gas as feedstock.

PIC's only major domestic operation was the planned construction of a second salt, chlorine, and chemical complex at the Shuaiba industrial area. The construction contract for the plant was awarded to Hitachi Zosen Co. of Japan in midyear. The plant was to produce 75 tons per day of chlorine, 84 tons per day of caustic soda, and 150 tons per day of salt. The complex was scheduled for completion early in 1986. PIC operated a smaller salt and chlorine plant a few kilometers north of Shuaiba.[11]

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Kuwait dinars (KD) to U.S. dollars at the rate of KD0.29=US$1.00.

[3] Energy and Mineral Resources Newsletter. Mar. 11, 1983, p. 77.

[4] Middle East Economic Survey. V. 26, No. 34, June 6, 1983, p. B5.

[5] Abecor Country Report (Barclay's Bank, London). Kuwait. June 1983, p. 2.

[6] U.S. Department of Commerce. Business America. Feb. 20, 1984, p. 53.

[7] Middle East Economic Survey. V. 26, No. 26, Apr. 11, 1983, pp. A8-A9.

[8] Oil and Gas Journal. Middle East Report. V. 81, No. 41, Oct. 10, 1983, pp. 133-134.

[9] Middle East Economic Survey. V. 26, No. 49, Sept. 19, 1983, pp. A6-A7.

[10] ———. V. 27, No. 5, Nov. 14, 1983, p. A8.

[11] ———. V. 27, No. 6, Nov. 21, 1983, pp. A11-A12.

The Mineral Industry of Liberia

By Ben A. Kornhauser[1]

The persisting world economic recession caused Liberia's gross domestic product (GDP) to continue to fall. The mineral industry, with its estimated input of $295 million, remained the mainstay of the economy, probably contributing more than 50% of the value of the GDP. Liberia's dominant mining sector, the iron ore industry, had an 18% decrease in production, resulting from the continued worldwide depressed steel market and decreasing ore grades at the Liberian mines. The Amoco Liberian Exploration Co. was granted four petroleum exploration licenses for an offshore area of about 8,884 square miles. The Government's petroleum refinery at Monrovia was closed as a step toward improving the country's economic position. Concessions to mine for gold had been granted in 1979 to the Bentley International Trading Co. in three large areas of southern Liberia. The Grand Geteh concession, the only one in operation in 1983, had a dredge operating daily.

The low levels of precipitation during the rainy season resulted in the early reduction of hydroelectric generation at the Mount Coffee Dam, Liberia's major hydroelectric plant. In December 1983, the water level dropped to 85 feet, just 3 feet short of a complete shutdown of the dam's four turbines. This drop necessitated running only two of the turbine's at three-quarter speed. During the rainy season, the plant furnished power to the Monrovia-Buchanan area, including supplying the Bong Mining Co. (BMC) with practically all of its electrical requirements. Thermal power from imported fuel oil normally was generated in the dry season to supplant much of the hydroelectric power. In the dry season, BMC contributed power in exchange for Mount Coffee's power in the rainy season. The unexpected reduction in hydroelectric power found the thermal generators down for repairs. BMC's power was cut early since one of the dam's turbines burned out a bearing near the end of the rainy season. The power cut caused BMC to consume its oil earlier, to generate its electricity thermally, and also affected its production.

PRODUCTION AND TRADE

Mineral trade and production, which decreased in all reported areas in 1983, contributed an estimated $295 million to the economy. The world trade depression reduced the values of iron ore and rubber that supplied 70% of the country's hard currency receipts and contributed to the budget deficits.[2] The higher exchange rate of Liberia's dollar, relative to other international currency, caused its exports to be more costly and less competitive in world markets, thus reducing its level of exports, encouraging lower priced imports, causing foreign exchange shortages, and increasing budget deficits. The export/import imbalance mirrored that of the United States. U.S. exports to Liberia amounted to $109.5 million while imports amounted to $80.5 million.[3]

Liberian iron ore production amounted to 14,937,000 tons while shipments were 15,606,000 tons. Production consisted of approximately 11.99 million tons of blast furnace feed composed of regular and washed fines, sinter feed, and washed lump ore; 2.5 million tons of pellets; and 0.45 million tons of high-grade concentrate for direct reduction use. Of the iron ore shipments, the five major importers were the Federal Republic of Germany, 37.3%; Italy, 23.0%; United States, 9.8%; Belgium, 6.8%; .and Spain, 6.1%.

Gold production essentially doubled over that of 1982. Diamond production decreased 8% from that of 1982. The major 1981 diamond importers were the United Kingdom, 48%; Belgium, 30%; United States, 21%; and Israel, 17%.

Gold exports in 1981 were valued at $5,335,000, and the major importers were the United States, 55%; Switzerland, 37%; Federal Republic of Germany, 3%; and Canada, 3%. Presumably 1983 gold exports followed the same pattern.

Table 1.—Liberia: Production of mineral commodities

Commodity[1]	1979	1980	1981	1982[p]	1983[e]
Cement, hydraulic thousand metric tons	[r]136	[r]106	86	80	60
Diamond:					
Gem[e] thousand carats	170	123	132	170	160
Industrial[e] do	132	175	204	263	240
Total[e] do	302	298	336	433	400
Gold[e] troy ounces	1,086	7,243	16,720	[2]12,656	25,000
Iron ore thousand metric tons	18,345	17,900	19,704	18,165	[3]14,937
Petroleum refinery products:[e]					
Gasoline thousand 42-gallon barrels	[3]541	500	500	NA	NA
Jet fuel do	[3]252	250	250		
Kerosine do	[3]68	60	60		
Distillate fuel oil do	[3]800	1,000	1,000		
Residual fuel oil do	[3]1,842	1,800	1,800		
Other do	[3]44	40	40		
Refinery fuel and losses do	[3]261	250	250		
Total do	3,808	3,900	3,900	NA	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1] In addition to the commodities listed, a variety of crude construction materials (clays, stone, and sand and gravel) were produced, but available information is inadequate to make reliable estimates of output levels.

[2] 1982 gold figure is based on gold taxed for export and includes smuggled gold. Source: Annual Report Republic of Liberia, Ministry of Lands, Mines and Energy, Dec. 31, 1982.

[3] Reported figure.

COMMODITY REVIEW

METALS

Gold.—Concessions were granted in 1979 to Bentley in three southern Liberian areas of approximately 200 square miles in Maryland County, 100 square miles in Grand Geteh County, and 100 square miles in Sinoe County. The primary causes for delay in their development were provisions for roads and infrastructure. The Grand Geteh concession, now in operation, was recovering 112.5 troy ounces per day using one dredge. The gold was of high purity with silver and tungsten as the principal impurities. A geological survey recently was completed of the Maryland County concession, adjoining the Grand Geteh property. Prospects showed high gold values and appeared suitable for a dredge operation along the Dubo River. About 20 other smaller groups were mining gold actively through Liberia. Some of the Liberian gold was smelted in local small-scale operations and incorporated in jewelry that was sold to tourists.[4]

Iron Ore.—During 1983, the LAMCO Joint Venture Operating Co. (LJV) encountered difficulties in exporting its ore because of the ban that the Government imposed to collect interest and royalty fees. LJV, with Government concurrence, trimmed its work force by one-third to accommodate its reduced production.

Integration of the LJV and the BMC operations was no longer under consideration by LJV. LJV produced 6,605,000 tons of usable ore consisting of 1,407,000 tons of lump ore, 4,750,000 tons of fines, and 448,000 tons of concentrates. BMC produced 7,500,000 tons of iron ore but shipped 7,636,000 tons of iron ore, about 1% less than in 1982, from the port of Monrovia. Of this total, 5,073,000 tons consisting of 1,947,000 tons of pellets and 3,126,000 tons of concentrates were shipped to Rohstoffhandel GmbH representing its West German owners. The remainder, 2,563,000 tons, was shipped to Finsider International S.S., BMC's Italian owner, consisting of 993,000 tons of pellets and 1,570,000 tons of concentrates.[5]

Liberia and Nigeria, with various other countries, had a 50% interest in the Mifergui-Nimba Co., in which the other 50% was owned by the Government of Guinea. Guinean representatives visited various European countries to discuss long-term iron ore supply contracts as a prelude to seeking financial support of up to $250 million from the European Economic Community for its Mifergui-Nimba Co. project. The United States Steel Corp. would be the operator and a part owner. The company owned three Guinean iron ore deposits—Pierre Richard, Sempere, and Chateau—in the Nimba mountains range just across the Liberian border from the LJV operations. Recoverable reserves in the Pierre Richard deposit were estimated at 315 million tons of ore averaging 66.7% iron and suitable for sinter feed. The ore was to be transported via LJV's existing railway to the Liberian port of Buchanan.

The National Iron Ore Co. Ltd. (100% Government-owned) only produced 832,000 tons of iron ore, of which 76% was regular fines.

MINERAL FUELS

Amoco was awarded four petroleum exploration licenses, covering an area of nearly 8,884 square miles offshore Grand Cape Mount County, Liberia. Initially, at least 2,170 miles of seismic surveys were to be undertaken and two exploratory wells were to be drilled at a depth of 3,000 meters. Each well would cost $6 million. The first test well was to start in mid-1984. The contracts entitled the Government to receive $100,000 per block as a signing bonus, $5,000 per block as a license fee for exploration, and annual rental payments of $10 per square kilometer for 22,900 square kilometers for the first 3 years. In the second and third phases of 2 or 3 years, Amoco committed to more seismic lines in each phase and annual rental payments of $20 and $30 per square kilometer, respectively.[6]

The Liberian Government closed its Liberian Petroleum Refining Co. at Monrovia in 1983, thus terminating the importing of crude petroleum and its Government monopoly. The 15,000-barrel-per-day refinery operated at a very high cost compared with alternative sources for its products. The refinery suffered high fuel losses and paid high freight rates since it had to use more expensive small tankers. Refined oil products would become direct purchases between individual buyers and sellers. This action, which would reduce financial pressure on the Government, was supported by the International Monetary Fund.[7] The refinery closing was expected to provide additional revenue of $17 to $20 million, if the current gasoline pump prices were maintained.

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[1] Physical scientist, Division of Foreign Data.

[2] Paris Marches Tropicaux et Mediterraneens. No. 1975, Sept. 16, 1983, p. 22081.

[3] Business America. V. 7, No. 4, Feb. 20, 1984, p. 35.

[4] American Metal Market. Gold Supplement. V. 91, No. 239, Dec. 9, 1983, pp. 7A, 13A,

[5] Skillings' Mining Review. V. 73, No. 10, Mar. 10, 1984, p. 8.

[6] New Liberian (Monrovia, Liberia). Apr. 15, 1981, pp. 1, 12.

[7] Business America. V. 6, No. 17, Aug. 22, 1983, p. 34.

The Mineral Industry of Libya

By John R. Lewis[1]

Petroleum remained the mainstay of Libya's economy in 1983, providing one-half the gross national product, 99% of the export earnings, and about 10% of the country's employment. Sluggish worldwide demand for oil and falling prices for crude caused a deficit in Libya's balance-of-payments account and slowed economic growth. Libya sold much of its crude oil to the Federal Republic of Germany, while Italy and Spain also bought heavily. Libya's crude, however, is light and low in sulfur, and it was severely hit by rising North Sea production and growth of the catalytic cracking process in Western Europe's refineries.

Late in the year, resumption of deliveries of liquefied natural gas (LNG) to Italy was agreed upon, having been suspended over a price dispute in 1980. The new price was very attractive to the buyer, but volumes to be delivered were only about one-third those formerly sold to Italy by Libya.

Development of a number of industrial units was slowed and, in several instances, temporarily halted. Import restrictions were tightened and the sale of crude oil at spot prices was accelerated in an attempt to acquire much needed foreign exchange. Payments due foreign suppliers were not paid promptly, and attempts were made in several instances to pay some of the country's obligations with oil. Turkey was one such country, which took 60,000 barrels per day (bbl/d). The oil was sold, and Turkish contractors were reimbursed by their Government for overdue Libyan payments.

The U.S. Embassy in Libya remained closed, and various other sources of information about the mineral industry of the country were, at best, minimal. Two major U.S. oil companies, Exxon Corp. and Mobil Oil Corp., had withdrawn from any activity in Libya, and several other U.S. firms had downgraded their operations there. Several U.S. oil companies had brought their U.S. employees home and replaced them with engineers from Western Europe or the United Kingdom. The number of U.S. citizens working in Libyan industry, mostly oil related, was about 2,600. A number of Iranian petroleum engineers were also working in Libya on an exchange scheme with the National Iranian Oil Co.

Mobil, after attempting to sell its limited exploration and production operations in Libya to a Philippine company without success, closed out its operations at the end of 1982 and spent all of 1983 seeking a settlement for its properties with the Libyan Government through arbitration. Unauthorized use by Libyan individuals of Mobil's Flying Red Horse logo prompted the company, in May, to publicly warn against infringement of its registered trademarks.

PRODUCTION AND TRADE

Libya's major source of foreign exchange continued, as it had for about 8 years, to be the production and export of crude oil and its associated products, particularly petrochemicals. However, oil production was off markedly from some earlier years, but showed only a minor drop of 3.9% from that of 1982. Daily average production, according to the Organization of Petroleum Exporting Countries (OPEC), of which Libya was a member, was 1,145,000 bbl/d in 1982 and 1,090,000 bbl/d in 1983. Unlike the active quarterly fluctuations of 1982, quarterly daily averages grew slightly each quarter to a fourth-quarter average of 1,150,000 bbl/d, a small but steady growth still far below the

2,100,000-bbl/d average production recorded in 1979.

During the first 10 days of December 1983, crude production reached 1,200,000 bbl/d. A breakdown, by producing companies, during this period follows:[2]

Producing company	Barrels per day
Oasis Oil Co. of Libya Inc. (Continental Oil Co., Marathon Oil Co., and Amerada-Hess Corp.) in partnership with the Libya National Oil Co. (LNOC)	425,000
Arabian Gulf Exploration Co. (AGECO), Umm al-Jawabi (LNOC for crudes from the Akmna and Sarir Fields)	285,000
Azienda Generali Italiana Petroli S.p.A. (AGIP) with LNOC	160,000
Occidental Petroleum Corp. with LNOC	140,000
Sirte Oil Co. (LNOC, formerly Esso Sirte Oil Co.)	120,000
LNOC (formerly Mobil Oil Libya Ltd.)	55,000
Others	15,000

The Soviet Union, according to the Oil and Gas Journal,[3] purchased 130,000 to 140,000 bbl/d of Libyan crude during the first half of 1983, more than double its purchases during the same period of 1982. Apparently, according to the Journal, most of this Libyan crude was passed along to other centrally planned economy countries and then largely reexported to Western European nations.

The United States prohibited the import of Libyan crude oil in March 1982, which reduced Libya's crude markets from 120,000 to 300,000 bbl/d. However, throughout 1983, there were indications that Libyan oil was entering the United States as products refined from Libyan crude in the Caribbean and in Europe. There were also indications that the volume was fairly substantial. Companies were warned by the U.S. Government that, although the Presidential proclamation prohibiting imports of Libyan crude did not specify refined products, their import was contrary to the spirit of the proclamation.

Libya's iron deposits, although low grade, are extensive and probably will be exploited when the Misratah iron and steel complex and its ancillary facilities, including a 900-kilometer railroad from the iron deposits, are completed. Much of this development was delayed in 1983, owing to reduced national income.

Petrochemical sales volume was steadily increasing in European markets. When the series of Libyan petrochemical plants along Libya's Mediterranean seacoast are completed, sales are expected to be much more voluminous. They are also expected to encounter competition from burgeoning petrochemical production facilities throughout the Middle East.

Table 1.—Libya: Production of mineral commodities[1]

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
Cement, hydraulic[e] thousand metric tons	3,200	3,200	3,200	4,000	5,000
Gas, natural:					
Gross million cubic feet	828,491	719,414	432,000	425,000	258,000
Marketed[3] do.	239,510	182,501	108,000	115,000	150,000
Gypsum thousand metric tons	181	180	180	175	180
Iron and steel: Crude steel[e] metric tons	10,000	10,000	10,000	10,000	10,000
Lime thousand metric tons	225	230	235	225	260
Nitrogen: N content of ammonia metric tons	[e]133,000	[e]150,000	[e]150,000	[4]244,100	250,000
Petroleum:					
Crude thousand 42-gallon barrels	763,471	669,780	407,705	418,000	401,500
Refinery products:					
Naphtha do.	--	3,905	3,833	4,000	4,000
Gasoline do.	5,110	4,450	3,250	4,000	5,000
Kerosine and jet fuel do.	5,840	3,835	4,100	5,000	7,000
Distillate fuel oil do.	13,505	9,415	7,350	8,000	10,000
Residual fuel oil do.	18,615	15,805	13,475	12,500	10,000
Other do.	365	300	475	500	600
Refinery fuel and losses do.	1,825	800	750	1,000	900
Total do.	45,260	38,510	33,233	35,000	37,500
Salt[e] thousand metric tons	10	10	10	10	12
Sulfur, byproduct of petroleum and natural gas[e] metric tons	15,000	12,000	11,000	12,000	14,000

[e] Estimated. [p] Preliminary.

[1] Table includes data available through Apr. 1984.

[2] In addition to the commodities listed, a variety of construction materials (sand and gravel, crushed stone, brick, and tile) is produced, but available information is inadequate to make reliable estimates of output levels. Natural gas liquids are also produced but are blended with crude petroleum and are reported as part of that total.

[3] Excludes gas reinjected into reservoirs.

[4] Reported figure.

Construction materials, including cement, gypsum, and lime were produced and consumed locally in varying quantities, as were potash and salt. Small amounts of cement were exported, despite sizable amounts that had to be imported to keep up with many construction projects. Sulfur, produced as a byproduct of crude refining, was also exported.

COMMODITY REVIEW

METALS

Aluminum.—There were indications, late in 1982, that development of the city of Zuwarah, with its seaport, electric generating facilities, and aluminum smelter, had been postponed. Subsequently, no money apparently had been allocated in 1983 for any segment of the Zuwarah industrial development program. There was a possibility of a startup of the aluminum plant by 1987, partially achieving the planned output of 120,000 to 130,000 tons per year. The first step would be completion and operation of one potline, producing 60,000 tons of aluminum metal per year.

Iron and Steel.—Construction work, at a somewhat reduced pace, continued at Libya's integrated iron and steel complex at Misratah on the Mediterranean coast about 225 kilometers east of Tripoli. The direct-reduction-based plant will have an initial raw steel capacity of 1,260,000 tons per year. Startup was originally scheduled for 1985, but will undoubtedly come later, and on a reduced scale at the outset. By May 1983, civil engineering for the rolling mill was practically complete, and about one-half of the plant components had arrived at the site. Most of the mill equipment, to be supplied by Kobe Steel Ltd. of Japan, was shipped during the summer. Twenty-nine Kobe Steel employees were among the 132 Japanese nationals working in Libya, and a similar number of Libyans were in Japan for training by Kobe Steel.

At the Misratah steelworks, the Czechoslovak entity, Doprastav, was engaged to build roads and other infrastructure valued at $57,000,000.[4] Doprastav was also building a 50-kilometer heavy-duty road from the Misratah complex to limestone and dolomite quarries at Sadidah, to the south. Design and construction supervision was by the British organization, W. S. Atkins.

Libya's reduced income continued to be a factor in further delays in construction of the 900-kilometer railroad for carrying iron ore from the mines at Wadi Shati to the mills at Misratah.

NONMETALS

Cement.—Two new cement plants were about ready to go on-stream with annual capacities of 1 million tons of cement each. Libya continued to move closer to independence on foreign sources for cement, which was in great demand for construction throughout the country. Limited trade data indicate that the country's cement imports in 1981 were 75,000 tons less than in 1980, and 101,000 tons less in 1982 than in 1981. As new plants achieve full operation, this trend appeared likely to continue. Status of the new cement plant at Derna, east of Benghazi, could not be determined, but earlier indications were that it would be ready to produce by mid-1983. The second of the new plants, the Zliten cement factory, at Zliten, was ready for startup at yearend and probably would commence operations early in 1984. The plant was to operate using a 1-million-ton-per-year vertical rolling mill for raw grinding. The project was handled by Kawasaki Heavy Industries Ltd. of Japan. Another cement plant was planned for Wadi Ashati with a capacity of 500,000 tons of cement per year. Kuljian Corp. was the contractor.[5]

Another increase in Libya's domestic cement production occurred when the Libyan Cement Co. started up the country's first sulfate-resistant cement production line at its Benghazi plant. This new line had an annual capacity of 270,000 tons of the special cement that resists corrosion from sulfate salts found in certain types of ground water and building materials. The new plant freed Libya from dependence upon foreign sources, primarily Italy, for this special product.

Lime.—Libyan Cement completed a third lime kiln, this one at its cement plant at Benghazi. Designed to produce 100 tons of quicklime per day, the plant raised productive capacity of the Benghazi plant to 200,000 tons of lime per year. The newest facility was built under a turnkey contract by a consortium of KHD Humboldt Wedag and Bilfinger & Berger, all of Mannheim, Federal Republic of Germany. The plant delivers its finished products into tanker-like bulk trucks at a rate of 100 tons per hour. The lime can also be bagged, using an 8-spout rotary packer and 66-pound bags. It is then stacked for transport on flatbed truck trailers.

Salt.—Salt is produced from brines at Tripoli, Tobruk, and from smaller plants along the coast. The chemical plant at Abu Kamash, in northwestern Libya, uses salt from nearby large salt beds to provide the chlorine for polyvinylchloride produced at the plant. Several other projects using seawater were under study, including the use of salt and brine deposits at Marada as feedstock via pipeline to the Ras Lanuf chemical facilities to make vinyl chloride monomer. Indications are that much more salt may be produced in Libya than is accounted for in the meager information available.

MINERAL FUELS

Natural Gas.—Libya has more natural gas than it can use, but most of what is produced is put to useful purposes rather than being flared to the atmosphere. Gas is a raw material feedstock for Libya's petrochemical plants, for electrical generation, seawater desalinization, and for LNG, which is exported mainly to southern European customers. For a number of years in the late 1970's, Libya liquefied and shipped natural gas to Italy and Spain. In 1980, deliveries of LNG from the plant at Marsa Brega to Italy's Ente Nazionale Idrocarburi (ENI) were suspended over a price dispute. Late in 1983, however, the two countries agreed to the resumption of deliveries of gas to Italy. The volume to be delivered was only about one-third of that formerly sold, and the price was understood to be between $3.35 and $3.40 per million British thermal units (Btu). This price appeared to be the best negotiated price in the area; about 50 cents per million Btu less than gas obtained by Italy from Libya's neighbor, Algeria. The LNG will be regasified at the Panigaglia plant of Snam Progetti S.p.A., an ENI subsidiary, and then used throughout Italy's gas distribution system.

The U.S.S.R. was reported in several sources[6] to be preparing to participate in the construction of a 570-kilometer gas pipeline along the Mediterranean coast of Libya. The facility will link gathering units at Marsa Brega with the petrochemical complex at Ras Lanuf, the fertilizer unit at Sirte, and the steelworks at Misratah.

Petroleum.—*Exploration.*— Settlement by the International Court of Justice of the offshore boundary dispute between Libya and Tunisia opened the way for further exploration on the Libyan side of the demarcation line in the Gulf of Gabès in the Mediterranean Sea. There was already activity by private firms on their concessions in 1982, but in 1983, Libya announced that the Bouri Field offshore reservoir in Block NC41B would be developed by the Libya National Oil Co. (LNOC), which held an 81% interest in the project, together with Azienda Generali Italiana Petroli S.p.A., which held a 19% tax- and royalty-free interest. Crude reserves were variously estimated to be between 500 million barrels and 6 to 7 billion barrels of oil. Italy's Snam was contracted to engineer the production facilities. A fixed steel offshore platform, standing in 492 feet of water, was to be used to develop the field. A total of 30 wells were planned, all to be drilled from the single platform. Ultimate output was expected to be 150,000 bbl/d in late 1987.

Production.—Crude oil production from Libya's 900-odd wells averaged 1,090,000 bbl/d in 1983, off about 55,000 bbl/d from daily average production in 1982. This was almost exactly in line with production quotas established for Libya by OPEC. During the first calendar quarter of the year, production averaged 950,000 bbl/d; in the second quarter, the average rose to 1,110,000 bbl/d; then to 1,144,000 bbl/d in the third quarter; and to 1,150,000 bbl/d in the final quarter. Libya dropped from its position as OPEC's sixth most prolific producer of oil to seventh. The OPEC-determined price for crude of $29 per barrel held in Libya throughout the year, but there were some spot price differentials as well as some equity oil discounting activity in the country.

Occidental Petroleum Corp. of the United States produced oil of its own in Libya as well as under a production-sharing contract with LNOC. In 1982, Occidental's share of Libyan production was about 175,000 bbl/d. In 1983, the company's share of Libya's total daily output was down to about 162,000 bbl/d. Occidental was seeking a partner to buy 49% of its equity interests in Libya but did not succeed.

At least one extensive enhanced oil recovery project was pronounced a success in Libya during the year.[7] The relatively new tertiary recovery process permits recovery of oil that would otherwise remain in the reservoir and never be produced. At the Intisar D reservoir on the east side of the Sirte Basin, Occidental of Libya was meeting success using a hydrocarbon miscible gas drive to produce 40,000 bbl/d of 40° API gravity crude from an upper Paleocene limestone reservoir covering 3,300 acres and using 20 producing wells and 6 injection wells. The project was begun in 1969 as a waterflood, and when the miscible drive has been completed, about 80% of the oil originally in the reservoir will have been recovered.

Refining.—Although numerous target dates had been set for starting up Libya's first really sizable oil refinery, the facility of the Ras Lanuf Oil and Gas Processing Co. at the coastal town of Ras Lanuf, by yearend 1983, was still in the process of being made ready for commercial production. Rated at a crude throughput of 220,000 to 235,000 bbl/d, plans called for operational testing about January 1984, with full operation to begin shortly thereafter. Crude feedstock was to be a 50-50 mix of Sarir and Mesla crudes. When fully operational, the product yields were projected to be naphtha, 35,000 bbl/d; gas oil, 50,000 bbl/d; fuel oil, 124,000 bbl/d; and kerosine-jet fuel, 11,000 bbl/d.

An assortment of large projects were ongoing during 1983 to improve petroleum product storage and handling. At the Tobruk tank farm and oil terminal of the Government-owned Arabian Gulf Oil Co., a $6 million turnkey contract to repair and refurbish existing tankage was completed, and a $3 million project to automate the entire terminal was begun. At Misratah, the Brega Petroleum Marketing Co. was committed to a $71 million project involving a petroleum product terminal, which consisted of $10 million worth of storage tankage, including 14 tanks with a total storage capacity of 2.5 million barrels of petroleum products and 5 spherical tanks for pressurized storage of liquefied petroleum gas. Meanwhile, also at Misratah, the $220 million tanker terminal was 40% complete while work was proceeding on other petroleum storage capability at Tripoli worth $36 million.

Transportation.—The Libyan tanker fleet was expanded by 25% in 1981 when three new Swedish-built ships of 155,000 deadweight tons each were added to the fleet. By 1983, need for the fleet's 12 tankers was down, and the National Corp. for Maritime Transport sold 2 of its smaller tankers, 47,000 deadweight tons each, to Greek interests. The two ships, the *Marasa el-Hariga* and the *Serir* were built in Spain in 1973.

Petrochemicals.—Libyan industrial construction activities, slowed in 1982 because of reduced oil income, appeared to be increasing in the petrochemical area in 1983. In addition to ongoing and widely varied petrochemical plant construction at Ras Lanuf, Marsa Brega, and Abu Kamash, construction of yet another sizable fertilizer complex, costing $1 billion, was about to start at Sirte. Described as major new ammonia and urea facilities, the complex was scheduled to begin operations in 1987; it will comprise two ammonia plants, a urea unit, an ammonium sulfate plant, a sulfuric acid plant, and two nitrogen-phosphorus-potassium units. These additional capacities will probably satisfy domestic demand for granular fertilizer and provide ammonia and urea for export. Most of these products will be exported through the plant's own nine-berth harbor, which was nearing completion by the Republic of Korea's Hyundai Construction and Engineering Co. under a $300 million contract negotiated in 1980.

Methanol production from the plant of LNOC at Marsa Brega again increased during 1983. By February, the plant was producing at an annual rate of 353,000 tons, which, according to the plant's owners, was 107% of its design capacity.

Libya was shipping petrochemicals, mainly ammonia and methanol, to foreign customers during the year. A shipload went to Tunisia while a second shipload was to travel from Marsa Brega to northwestern Europe. A Soviet tanker, the *Auskelis*, carrying Libyan methanol destined for Sundsvall, Sweden, was temporarily held by Sweden pending cessation of certain military operations being necessarily undertaken in Swedish waters.

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[1] Physical scientist, Division of Foreign Data.

[2] Middle East Economic Survey (Nicosia, Cyprus). V. 27, No. 10, Dec. 19, 1983, p. A7.

[3] Oil and Gas Journal. OGJ Newsletter. V. 81, No. 48, Nov. 28, 1983, p. 4.

[4] Where necessary, values have been converted from Libyan dinars (LD) to U.S. dollars at the rate of LD0.30=US$1.00.

[5] Rock Products Magazine. V. 87, No. 4, Apr. 1984, p. 56.

[6] Petroleum Economist Magazine (London). V. 50, No. 3, Mar. 1983, p. 107.

[7] Oil and Gas Journal. V. 82, No. 14, Apr. 2, 1984, pp. 92-93.

The Mineral Industry of Madagascar

By Kevin Connor[1]

The year 1983 was a period of mixed performance for the mineral industries of Madagascar. The chromite ore and mica industries registered continued substantial declines in both production and trade, a condition that resulted from another year of poor international market demand for these commodities. Although registering some decline in production and trading of graphite, the prognosis for the industry was one of stabilization. Modernization work was underway at two of the island's six graphite mining operations, all of which are located in the Manampotsy District, within close proximity to the major Port of Tamatave. The results of the petroleum exploration efforts, which encompassed survey work by four international petroleum companies, was quite positive and exploration well drilling was expected to get underway by two of the firms before the end of 1984. Petroleum exploration and evaluation efforts in the Bemolanga bituminous deposits of west-central Madagascar went according to schedule.

PRODUCTION AND TRADE

Declines in both the mineral production and mineral export trade sectors were reported for Madagascar in 1983, with poor market demand cited as the major reason. The chromite industry has experienced unavoidable problems in the past 2 years, with the 1983 ore production total 58% less than that of the 1981 total figure, and the tonnage of ore concentrate exported down by over 40% from 1982 trade figures. Reported export tonnage of chromite ore in 1983 was approximately 41,774 tons. The unit market value of the ore remained steady with total trade receipts for the chromite ore at slightly under $2 million.[2] Graphite production and export sales were down 12% and 20%, respectively, from that of 1982. Total export receipts for the 11,662 tons of graphite sold was approximately $5.7 million, which was only 6.6% less than the previous year owing to a unit market value increase for the graphite of 15%. The reported mica production was 17% less than that of 1982. Tonnage exports of mica were 35% less than the previous year, and 30% less in value with total trade receipts about $550,000. Semiprecious and ornamental stones such as beryl, tourmaline, amethyst, citrine, and rose and smoked quartz were also mined and exported in small quantities. The total value of exports for the ornamental and semiprecious stones was estimated to be slightly less than receipts from the mica trade. Madagascar continued to export small quantities of scrap metal, salt, abrasives, and silver. Also as in previous years, small quantities of byproducts from the country's sole petroleum refinery at Tamatave were exported to neighboring islands.

Table 1.—Madagascar: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Beryllium: Beryl concentrate, industrial-grade, gross weight[e]	10	10	10	10	10
Chromium: Chromite concentrate, gross weight	128,347	180,000	99,689	44,223	[3]41,598
Gold, mine output, metal content troy ounces	125	114	[e]110	[e]110	110
Nickel, mine output, metal content	NA	100	NA	NA	NA
NONMETALS					
Abrasives, natural: Garnet (industrial only)[e] kilograms	5,000	5,000	5,000	5,000	5,000
Cement, hydraulic	70,000	60,050	35,796	35,921	35,000
Clays: Kaolin	1,899	2,858	1,746	2,511	2,500
Feldspar[e] kilograms	1,830	1,800	1,800	1,800	1,800
Gem and ornamental stones:					
Agate do.	7,514	14,381	45,822	[r] [e]20,000	20,000
Amazonite do.	1,459	1,300	711	700	700
Amethyst:					
Gem do.	31	10	24	12	15
Geodes do.	2,393	3,400	350	4,300	4,300
Apatite (ornamental only) do.	175	200	29	[e]30	30
Aragonite	1,120	969	1,166	1,101	1,100
Beryl kilograms	[r]5,336	6,115	NA	68,400	65,000
Calcite (ornamental only)	2	--	NA	NA	NA
Celestine kilograms	24,846	22,758	24,882	27,000	30,000
Citrine, gem do.	7	8	33	[e]30	30
Cordierite do.	158	154	348	[e]350	350
Garnet:					
Gem do.	5	1,666	NA	60	60
Other ornamental do.	1,251	NA	NA	NA	NA
Jasper do.	2,930	2,305	2,850	17,100	17,000
Labradorite do.	7,500	24,806	3,084	9,200	9,000
Quartz:					
Rose quartz do.	39,683	84,460	58,842	[e]58,850	59,000
Geodes do.	950	57	60	[e]60	60
Other ornamental do.	1,299	21,649	3,527	[e]3,500	3,500
Rhodonite do.	11,990	350	NA	NA	NA
Tourmaline:					
Gem do.	734	1,745	[e]1,750	[e]1,750	1,750
Other ornamental do.	1,134	NA	NA	NA	NA
Graphite, all grades	14,242	12,252	13,334	15,354	[3]13,548
Mica, phlogopite:					
Block	61	84	334	NA	NA
Splittings and sheet	1,106	1,647	NA	NA	NA
Scrap	NA	NA	49	NA	NA
Total	NA	NA	383	1,300	[3]1,085
Quartz, piezoelectric kilograms	52	167	73	55	--
Salt, marine[e]	30,000	30,000	30,000	30,000	30,000
Stone:					
Calcite, industrial	1,973	[e]2,000	[e]2,000	[e]2,000	2,000
Marble, cipoline	4,017	470	NA	13	15
Other: Bastnasite kilograms	22,313	[e]23,000	[e]23,000	[e]23,000	23,000
MINERAL FUELS AND RELATED MATERIALS					
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	478	[e]500	544	630	650
Kerosine and jet fuel do.	275	[e]300	335	360	400
Distillate fuel oil do.	502	[e]500	747	876	900
Residual fuel oil do.	1,151	[e]1,200	935	1,093	1,100
Other do.	44	[e]50	37	51	100
Refinery fuel and losses do.	[e]335	[e]350	NA	NA	NA
Total do.	2,785	[e]2,900	2,598	3,010	3,150

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through May 8, 1984.

[2] In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, stone, and sand and gravel) presumably are produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

Table 2.—Madagascar: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1980	1981	Destinations, 1981	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, semimanufactures	--	1	1	
Chromium: Ore and concentrate	85,910	80,831	37,281	France 43,549.
Copper: Metal including alloys, semimanufactures	NA	10	NA	NA.
Iron and steel: Metal:				
Scrap value	--	$5,000	--	All to Switzerland.
Semimanufactures:				
Bars, rods, angles, shapes, sections	--	3	NA	NA.
Universals, plates, sheets	228	1,402	11	Mozambique 1,200; Reunion 121.
Tubes, pipes, fittings value	NA	$1,000	NA	NA.
Lead: Metal including alloys, semimanufactures do	--	$1,000	--	All to France.
Tungsten: Metal including alloys, all forms	--	2	NA	NA.
Other: Ashes and residues value, thousands	--	$54	--	All to Japan.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc do	NA	$165	--	All to West Germany.
Grinding and polishing wheels and stones value	--	$2,000	--	All to France.
Cement do	--	$1,000	--	All to Ivory Coast.
Clays, crude	146	--		
Graphite, natural	9,481	16,353	3,555	United Kingdom 6,198; West Germany 3,578.
Mica:				
Crude including splittings and waste	691	887	52	France 419; Netherlands 350; West Germany 61.
Worked including agglomerated splittings	4	1	--	All to France.
Pigments, mineral: Iron oxides and hydroxides, processed	--	3	--	NA.
Precious and semiprecious stones other than diamond: Natural value, thousands	$688	$548	--	West Germany $268; U.S.S.R. $89; France $72.
Salt and brine	996	2,241	--	Comoros 1,568; Reunion 671.
Sodium compounds, n.e.s.: Carbonate, natural and manufactured	--	47	--	United Kingdom 19; France 15; Romania 7.
Sulfur: Sulfuric acid	--	11	--	United Kingdom 5; France 3.
Other:				
Crude	457	114	--	All to Japan.
Slag and dross, not metal-bearing	--	1	--	All to Reunion.
MINERAL FUELS AND RELATED MATERIALS				
Coal: All grades including briquets	31,176	25	--	All to West Germany.
Petroleum:				
Crude 42-gallon barrels	--	374	--	West Germany 32; Netherlands 20.
Refinery products:				
Nonbunker:				
Gasoline do	8	37,086	--	Somalia 37,060.
Kerosine and jet fuel do	15,864	5,697	--	France 2,108; Reunion 884; U.S.S.R. 698.
Distillate fuel oil do	82	--		
Lubricants do	35	3,594	--	NA.
Residual fuel oil do	368,911	871,488	167,592	Singapore 684,848; Reunion 19,041.
Unspecified do	333	--		
Bunkers:				
Gasoline: Motor do	5,006	51		
Kerosine and jet fuel do	2,209	19,863		
Distillate fuel oil do	8,042	128,282		
Residual fuel oil do	358,308	114,432		
Lubricants do	11,781	46		

NA Not available.

[1] Table prepared by Virginia A. Woodson.

Table 3.—Madagascar: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1980	1981	Sources, 1981	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	2	(2)	--	All from France.
Aluminum:				
Ore and concentrate	--	523	--	Do.
Oxides and hydroxides	3	9	--	Do.
Metal including alloys:				
Scrap	154	5	--	All from West Germany.
Semimanufactures	830	319	--	France 293; West Germany 14.
Chromium: Oxides and hydroxides	2	2	--	All from France.
Cobalt: Oxides and hydroxides	7	--		
Copper: Metal including alloys:				
Unwrought	--	2	--	Do.
Semimanufactures	59	37	--	France 25; China 8.
Iron and steel: Metal:				
Scrap	8	--		
Pig iron, cast iron, related materials	157	76	--	All from France.
Semimanufactures:				
Bars, rods, angles, shapes, sections	18,680	10,804	13	France 3,730; Italy 2,578; Japan 1,638.
Universals, plates, sheets	21,750	7,466	--	Japan 3,767; France 2,885; Australia 318.
Hoop and strip	799	179	--	France 107; Mozambique 36; West Germany 27.
Rails and accessories	95	6,373	--	France 6,365.
Wire	3,930	1,592	--	France 657; Japan 465; Italy 146.
Tubes, pipes, fittings	6,657	4,837	5	France 4,142; Mozambique 217.
Lead:				
Oxides	17	--		
Metal including alloys:				
Scrap	--	1	--	All from United Kingdom.
Unwrought	--	56	--	France 55; West Germany 1.
Semimanufactures	202	8	--	France 7.
Magnesium: Metal including alloys:				
Semimanufactures value	--	$1,000	--	All from Australia.
All forms	5	--		
Manganese: Oxides	2	--		
Nickel: Metal including alloys:				
Semimanufactures	--	5	--	All from France.
All forms value	$2,000	--		
Tin:				
Ore and concentrate	--	86	--	Do.
Metal including alloys:				
Unwrought	1	--		
Semimanufactures	4	1	--	Do.
Tungsten: Metal including alloys, all forms	1	--		
Zinc:				
Oxides	21	(3)	--	Do.
Metal including alloys, semimanufactures	488	133	--	Do.
Other:				
Ores and concentrates	2	--		
Oxides and hydroxides value	NA	$2,000	--	All from West Germany.
Base metals including alloys, all forms	--	3	--	All from China.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc value	$15,000	$1,000	--	All from France.
Artificial: Corundum	3	--		
Grinding and polishing wheels and stones	53	19	--	France 9; Hong Kong 5; Italy 3.
Boron materials:				
Crude natural borates	95	--		
Oxides and acids	3	3	--	All from France.
Cement	69,196	146,957	NA	Mozambique 45,401; U.S.S.R. 39,334; North Korea 22,933.
Clays, crude	441	65	--	West Germany 55; China 10.
Diatomite and other infusorial earth value	$1,000	$1,000	--	All from France.
Fertilizer materials:				
Crude, n.e.s	28	13	--	Do.
Manufactured:				
Ammonia	52	13	--	France 12; West Germany 1.
Nitrogenous	5,666	738	--	France 288; West Germany 267.
Phosphatic	4,416	3,224	--	Belgium-Luxembourg 1,668; Tunisia 800; Sweden 409.
Potassic	3,795	1,163	485	Belgium-Luxembourg 678.
Unspecified and mixed	7,511	5,402	--	Netherlands 3,119; Italy 1,550.
Graphite, natural	NA	8	--	All from France.
Gypsum and plaster	2,359	18	--	Do.
Lime	1,608	451	--	France 358; Belgium-Luxembourg 75.
Magnesite	4	10	--	All from France.

See footnotes at end of table.

Table 3.—Madagascar: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1980	1981	Sources, 1981	
			United States	Other (principal)
NONMETALS —Continued				
Mica: Worked including agglomerated splittings	1	(4)	--	All from France.
Phosphates, crude	--	13	--	Do.
Pigments, mineral: Iron oxides and hydroxides, processed	42	13	--	All from West Germany.
Salt and brine	3	8	--	All from France.
Sodium compounds, n.e.s.:				
Carbonate, natural and manufactured	1,237	743	--	Kenya 480; France 199.
Sulfate, natural and manufactured	3,418	2,485	--	West Germany 1,100; East Germany 774; France 315.
Sulfur:				
Elemental: Colloidal, precipitated, sublimed	14	8	--	Belgium-Luxembourg 7; France 1.
Sulfuric acid	242	78	--	Netherlands 40; France 22.
Talc, steatite, soapstone, pyrophyllite	10	1,201	--	All from Japan.
Other: Crude	1,020	199	--	All from Belgium-Luxembourg.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	6	(4)	--	All from Canada.
Coal: All grades including briquets	27,114	1	NA	NA.
Coke and semicoke	102	12,570	NA	NA.
Petroleum:				
Crude thousand 42-gallon barrels	971	1,173	--	United Arab Emirates 820; Saudi Arabia 353.
Refinery products:				
Liquefied petroleum gas do.	60	383	--	All from Saudi Arabia.
Gasoline do.	1,200	426	--	Iraq 417; Italy 8.
Mineral jelly and wax do.	60	19	--	West Germany 7; Japan 7; China 5.
Kerosine and jet fuel do.	149	12	--	Netherlands 10; Singapore 1.
Distillate fuel oil do.	188	225	--	Italy 106; Netherlands 102.
Lubricants do.	8	14	(5)	France 13.
Residual fuel oil do.	175	(5)	--	All from Kuwait.
Bitumen and other residues do.	16	(5)	--	NA.

NA Not available.
[1] Table prepared by Virginia A. Woodson.
[2] Unreported quantity valued at $8,000.
[3] Unreported quantity valued at $5,000.
[4] Unreported quantity valued at $1,000.
[5] Less than 1/2 unit.

COMMODITY REVIEW

MINERAL FUELS

Heavy Oil.—Drilling and coring operations of the second-phase project to further delineate the commercial feasibility of exploiting the Tsimiroro tar sands of west-central Madagascar went according to program plans in 1983. The $16.5 million project, funded through an International Bank for Reconstruction and Development credit and the Organization of Petroleum Exporting Countries, was scheduled to drill approximately 10 test wells by yearend 1984. After completion of the wells, injection of an oil-solubilizing fluid and heavy oil production tests would be conducted to assess the in situ extractive potential of the well development technology.

The first phase of evaluation of the oil sands, which are located 130 kilometers northeast of the deeper and less attractive Bemolanga bituminous sandstones, began in 1979 with seismic survey work. Coring and laboratory test studies followed to assess the practicality of developing the sands using well field technology. The second-phase drilling began early in 1983, and completion of injection and production tests are scheduled for mid-1985.

Petroleum.—In October, AMOCO Madagascar Petroleum Co. and the Government's Office Militaire National pour les Industries Strətegiques (OMNIS) signed a new joint venture agreement for oil and gas exploration in the Belo-sur-Mer-Manja area. The new project would divert some of AMOCO's exploration efforts, which have concentrated in the offshore Bemaraha area, to the onshore Belo-sur-Mer-Manja area. The signing with AMOCO for the additional exploration was a result of a second round of international invitations to submit exploration proposals for the onshore areas of Belo-sur-Mer-Manja and Morombe, and the offshore areas of Morondava-Toliary and Ambilobe. Of the four areas opened for exploration bids in the second round, only AMOCO had signed an agreement for one of the areas by yearend 1983. Other international petroleum oil companies exploring first-round concessions granted under joint venture agreements with OMNIS are two U.S. companies, Occidental Petroleum Corp. and Mobil Oil Corp., and the Italian firm Azienda Generali Italiana Petroli S.p.A. (AGIP). Occidental was performing aeromagnetic and seismic survey work throughout the year within its onshore concession around the Toliara area, while Mobil completed a second round of seismic survey activities on their western offshore concession of the Morondava Basin. AGIP was investigating a concession northeast of Morondava in the Majunga Basin.

All three U.S. oil companies reported encouraging results from seismic studies and other geophysical evaluations on their concessions, and were expected to continue with their respective programs in 1984 to search for petroleum reserves. In anticipation of contracting with OMNIS for an additional concession area, AMOCO engaged a second seismic crew in the early fall of 1983. To continue on schedule, AMOCO was required to begin drilling operations within its first concession by October 1984, and have completed three wells by August 1985. Occidental was reported to have completed the majority of geophysical activity during 1983 necessary to make a decision on whether to drill any exploration wells, an option of their contract. Although seismic results were reported to offer definite potential for the discovery of oil reserves, Occidental's decision on whether to drill any wells was being delayed. Occidental officials reported that the interim delay on the drilling decision was more of a corporate cash-flow problem than a geophysical decision. As of yearend 1983, Occidental had spent approximately $17 million on their exploration activities in Madagascar. Mobil was also reported to be concerned with exploration-capital matters.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Madagascar francs (FMG) to U.S. dollars at the rate of FMG445=US$1.00.

The Mineral Industry of Malaysia

By John C. Wu[1]

Malaysia remained the world's largest producer of tin, accounting for 29% of the world mine production in 1983. The tin mining industry continued to suffer from high levels of unemployment in the gravel pump sector that was forced to shut down more small and less efficient mines. Tin mine production dropped to the lowest level since 1960 and tin smuggling activities intensified, after the export control of tin was implemented by the International Tin Council (ITC) in April 1982.

In an effort to stabilize the price of tin in the world market, in 1983 the ITC members, including Malaysia, agreed to increase the cutback of exports from 36% to 39.6%. In addition, various strict antismuggling measures were put into effect by the Government of Malaysia.

In August, the Association of Tin Producing Countries (ATPC) was formally established in Kuala Lumpur according to an agreement signed by Malaysia, Indonesia, and Thailand in Bangkok in June. An Indonesian official was named the first executive secretary of ATPC. Other major tin-producing countries including Bolivia, Nigeria, and Zaire joined ATPC in late 1983.

The significance of the mineral fuels sector in the Malaysian mineral industry increased as the output of crude petroleum reached an average of 380,000 barrels per day. Malaysia joined the ranks of liquefied natural gas (LNG) exporting countries, when the first train of the Bintulu LNG plant started commercial operation in Sarawak in January. Export earnings of crude petroleum and LNG were estimated at $3.7 billion, accounting for 28% of the total export earnings. Tax revenues collected from the mineral fuel sector constituted about 22% of the total Federal Government revenue.

The activities of bauxite and iron ore mining followed the 1982 downward trend owing to weak demand, but ilmenite production rebounded to the 1981 level because of increased exports to Japan. Production of copper concentrate at the Mamut Mine for export to Japan remained at the same level as that of 1982.

The activity of the nonmetallic sector was mixed. Despite a continuing growth in demand for cement, Malaysia's cement output remained at the 3.1-million-ton level. However, the imbalance of supply and demand for cement is expected to disappear after the 1.2-million-ton-per-year-capacity plant on Langkawi Island is completed in 1984. In addition, another cement plant with an annual capacity of 1.2 million tons is expected to be completed by Korea Heavy Industries Construction Co. Ltd. in Padang Rengas in Perak by 1985.

Malaysia's chemical fertilizer production remained depressed in 1983 because of a sharp drop in consumption by the rubber and palm oil sectors. On the contrary, production of kaolin, limestone, crushed rock, granite, and sand and gravel remained at a high level owing to on-going major industrial and housing projects.

The contribution of the mining industry to Malaysia's economy increased to over 4% of Malaysia's gross national product, which was estimated at $27.5 billion in 1983 current dollars.[2] The real gross domestic product (GDP) in 1970 constant dollars grew 5.6% to $13.5 billion in 1983. The driving force of Malaysian economic growth was mainly due to the export strength of petroleum products, LNG, and manufactured electrical components despite the slower growth in the output of the agriculture and forestry sectors, which accounted for 23% of GDP.[3]

Malaysia reversed its balance of merchandise trade to a surplus of $470 million from a deficit of $370 million in 1982 owing primarily to increased export earnings of crude petroleum and LNG.

To promote and increase foreign trade, a special countertrade unit was set up by the Ministry of Trade and Industry in July. The countertrade unit will serve as an information clearinghouse and provide advice and guidelines on the conduct of countertrade but will not be directly involved in negotiations and transactions.

PRODUCTION

The mineral industry of Malaysia continued to be dominated by the mineral fuels sector, which helped to generate about 22% of total Federal Government revenues as well as contributing about 28% of Malaysia's export earnings. Despite a 15% drop in the export price of Malaysian crude, the output of crude oil rose to an average of 380,000 barrels per day. Production of natural gas was also boosted by the startup of the Bintulu LNG plant in January. The total output of LNG was estimated at 1.6 million tons.

The Malaysian tin industry remained depressed. The output of tin dropped to the lowest level since 1960. Because of export restrictions implemented by the ITC and rising production costs, the gravel pump sector of tin mining continued to suffer. During the year, about 7,000 additional mine workers lost their jobs. In late 1983, closing of tin mining operations was extended to dredging sectors of major tin mining companies such as Malaysia Mining Corp. (MMC), Killinghall Tin (Malaysia) Bhd., and Ayer Hitam Tin Dredging Bhd. Other metallic mining including bauxite, iron ore, and silver remained at a low level except copper, ilmenite, and gold, which were supported by stronger demand from export markets.

Production of cement and other nonmetallic minerals remained on an upward trend while production of chemical fertilizer continued at a lower level because of the cutback in rubber and palm oil production.

Table 1.—Malaysia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum: Bauxite, gross weight thousand tons	387	920	701	589	[3]502
Antimony, mine output, metal content (Sarawak)	307	131	191	115	180
Columbium and tantalum concentrate, gross weight	40	33	23	7	60
Copper, mine output, metal content (Sabah)	24,514	27,013	28,642	31,546	30,000
Gold, mine output, metal content:					
Malaya troy ounces	5,493	4,621	5,691	5,814	[3]5,792
Sabah do.	55,292	60,905	69,915	[e]70,000	70,000
Sarawak do.	1,063	379	82	26	120
Total do.	61,848	65,905	75,688	75,840	75,912
Iron and steel:					
Iron ore and concentrate thousand tons	350	371	532	340	[3]114
Steel, crude do.	207	210	210	210	210
Manganese ore and concentrate, gross weight	31,605	4,003	--	--	--
Rare-earth metals: Monazite, gross weight[4]	542	347	320	582	1,160
Silver, mine output, metal content (Sabah) thousand troy ounces	432	437	472	[e]470	470
Tin:					
Mine output, metal content	62,995	61,404	59,938	52,342	[3]41,367
Metal, smelter	73,068	71,318	69,169	62,836	62,000
Titanium: Ilmenite concentrate, gross weight[4]	199,819	189,121	172,757	101,202	190,000
Tungsten, mine output, metal content	27	14	35	43	40
Zirconium: Zircon concentrate, gross weight[4]	1,271	470	680	2,147	2,750
NONMETALS					
Barite	1,401	--	19,365	25,272	20,300
Cement, hydraulic thousand tons	2,265	2,349	2,833	3,123	3,100
Clays: Kaolin	32,934	46,324	44,084	44,363	[3]57,432
Nitrogen: N content of ammonia	52,000	41,100	37,000	27,800	28,800

See footnotes at end of table.

Table 1.—Malaysia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural (Sarawak):					
Gross million cubic feet	105,623	94,510	85,816	NA	NA
Marketed do	39,528	29,249	23,124	NA	NA
Petroleum:[5]					
Crude thousand 42-gallon barrels	103,296	100,916	94,210	120,450	[3]158,700
Refinery products:					
Gasoline do	3,868	4,038	NA	NA	NA
Jet fuel do	1,068	1,157	NA	NA	NA
Kerosine do	1,356	1,434	NA	NA	NA
Distillate fuel oil do	13,279	13,801	NA	NA	NA
Residual fuel oil do	14,619	15,152	NA	NA	NA
Other do	NA	NA	NA	NA	NA
Refinery fuel and losses do	NA	NA	NA	NA	NA
Total do	34,190	35,582	NA	NA	NA

[e]Estimated. [p]Preliminary. NA Not available.

[1] All production is from peninsular Malaysia (Malaya) unless otherwise specified. Table includes data available through July 3, 1984.

[2] In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone), salt, and fertilizers are produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

[4] Based on export figures.

[5] Includes production from Malaya, Sarawak, and Sabah.

TRADE

Malaysia's export earnings rose 14% to $13.8 billion, while import bills rose only 6.7% to $13.3 billion. As a result, overall trade balance rebounded to a trade surplus of $470 million in 1983 from a deficit of $370 million in 1982.

According to Malaysia's Ministry of Finance, exports of crude petroleum and gas rose 13% owing to additional earnings from exports of LNG. Exports of tin improved slightly to $697 million from $640 million in 1982. Exports of other major commodities including electrical components and products, rubber, and palm oil also rose slightly.

Electrical components, machinery, transport equipment, manufactured goods, and petroleum products remained the major import commodities, and about 31% of Malaysia's imports were capital goods.

Malaysia's principal trading partners, in order of relative importance, were Japan, Singapore, the European Economic Community (EEC), and the United States. Exports of crude petroleum were mainly to Japan, Singapore, and the United States; all LNG was exported to Japan, and tin was principally exported to Japan and the Netherlands. All exports of bauxite, copper concentrate, and ilmenite were to Japan. Malaysia imported electrical components, machinery, transport equipment, chemicals, and manufactured goods from the United States (about $2.1 billion), Japan, and the EEC. Malaysia imported most of its petroleum and petroleum products from Saudi Arabia, Singapore, and Kuwait.

Table 2.—Malaysia: Exports and reexports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	642,450	418,015	--	Japan 386,350; Taiwan 26,500.
Metal including alloys:				
Scrap	3,283	3,191	--	Japan 2,519; Singapore 336; Pakistan 198.
Unwrought	147	76	--	Singapore 59.
Semimanufactures	4,656	7,025	10	Singapore 5,555; China 381.
Antimony: Ore and concentrate	414	100	--	All to Belgium-Luxembourg.
Columbium and tantalum: Ore and concentrate	64	29	--	All to Netherlands.
Copper:				
Ore and concentrate	129,296	121,069	--	Mainly to Japan.
Metal including alloys:				
Scrap	6,033	6,660	35	Singapore 4,155; Japan 1,504; India 642.
Unwrought	2	10	--	All to Singapore.
Semimanufactures	515	918	--	Singapore 624; Japan 211.
Gold:				
Waste and sweepings troy ounces	37,035	15,981	7,916	West Germany 4,756; Singapore 2,332.
Metal including alloys, unwrought and partly wrought do.	8,299	8,688	2,571	Philippines 2,515; Japan 1,198; Singapore 1,126.
Iron and steel:				
Iron ore and concentrate including roasted pyrite	31,288	25,445	--	Singapore 25,253.
Metal:				
Scrap	11,842	6,450	--	Singapore 5,646.
Pig iron, cast iron, related materials	504	171	--	Singapore 151.
Ferroalloys	253	59	--	Mainly to Singapore.
Semimanufactures	21,047	21,866	942	Singapore 18,213; Brunei 894.
Silver:				
Ore and concentrate[2] thousand troy ounces	10,642	2,958	--	All to France.
Waste and sweepings[2] do.	1,190	739	643	Singapore 64.
Metal including alloys, unwrought and partly wrought do.	1,937	1,516	43	Hong Kong 1,066; Singapore 182.
Tin: Metal including alloys:				
Scrap	341	448	4	Singapore 263; United Kingdom 180.
Unwrought	66,507	48,718	722	Netherlands 26,744; Japan 12,941; U.S.S.R. 3,700.
Semimanufactures	9	38	6	Singapore 25.
Titanium:				
Ore and concentrate	176,608	82,389	--	Japan 56,104; Republic of Korea 15,310; Taiwan 10,322.
Oxides	28	42	--	Mainly to Singapore.
Tungsten: Ore and concentrate	71	80	20	West Germany 20; Singapore 16; Netherlands 10.
Uranium and/or thorium:				
Ore and concentrate	320	632	325	Netherlands 213; Japan 84.
Metal including alloys, all forms kilograms	--	420	--	All to Singapore.
Zinc:				
Oxides	315	1,793	--	Japan 1,751.
Metal including alloys:				
Scrap	754	492	--	Singapore 285; Japan 106; Taiwan 59.
Unwrought	129	143	--	Japan 83; Taiwan 60.
Semimanufactures	58	102	--	Singapore 55; Japan 30.
Zirconium: Ore and concentrate	1,258	2,270	--	Japan 1,920; Republic of Korea 227.
NONMETALS				
Barite and witherite	--	4,120	--	Singapore 2,851; Indonesia 1,269.
Cement	(3)	17,046	--	Mainly to Singapore.
Chalk	1,827	3,449	--	Do.
Clays, crude	19,576	16,548	--	Taiwan 6,728; Singapore 5,758; Japan 2,948.
Fertilizer materials: Manufactured:				
Ammonia	269	207	(3)	Singapore 142; Hong Kong 35; Thailand 25.
Nitrogenous	1,039	9,910	--	Singapore 9,874.
Phosphatic	9,086	1,071	--	All to Singapore.
Potassic	205	22	--	Mainly to Singapore.
Unspecified and mixed	6,634	8,269	--	Hong Kong 4,324; Singapore 3,795.
Lime	8,154	10,106	--	Singapore 10,100.
Phosphates, crude	1,344	1,384	--	Hong Kong 1,170; Singapore 170.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$122	$205	--	West Germany $92; Singapore $40; Australia $39.
Synthetic do.	$151	$768	--	All to Japan.

See footnotes at end of table.

Table 2.—Malaysia: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Salt and brine	740	1,387	--	Singapore 611; Philippines 534.
Sodium compounds, n.e.s.: Carbonate, manufactured	30	67	--	Singapore 41; Brunei 24.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	3,784	290,035	--	Singapore 289,833.
Worked	69	53	--	Singapore 32; Thailand 12.
Dolomite, chiefly refractory-grade	1,986	15	--	All to Singapore.
Gravel and crushed rock	52,675	34,151	--	Brunei 19,757; Singapore 14,394.
Limestone other than dimension	18,373	16,111	--	Singapore 16,060.
Quartz and quartzite	596	222	--	All to Singapore.
Sand other than metal-bearing	349,928	535,704	7	Singapore 436,898; Japan 77,970; Philippines 17,310.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	4,240	5,022	([3])	Singapore 2,397; Indonesia 1,655; India 890.
Petroleum:				
Crude --- thousand 42-gallon barrels	78,194	92,306	3,464	Singapore 42,529; Japan 25,718; Thailand 10,134.
Refinery products:				
Gasoline --- do	1,488	1,237	--	Mainly to Singapore.
Kerosine and jet fuel --- do	548	993	([3])	Do.
Distillate fuel oil --- do	([3])	21	--	Singapore 17.
Lubricants --- do	80	47	([3])	Singapore 24; Indonesia 22.
Residual fuel oil --- do	254	989	--	All to Singapore.

[1] Table prepared by Audrey D. Wilkes.
[2] May include platinum-group metals.
[3] Less than 1/2 unit.

Table 3.—Malaysia: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	1,506	1,108	1	China 550; Japan 305; United Kingdom 240.
Oxides and hydroxides	5,547	2,586	4	Japan 2,577.
Metal including alloys:				
Scrap	260	547	([2])	Singapore 424; Japan 56.
Unwrought	14,931	23,078	152	Canada 9,977; Australia 3,831; Ghana 2,314.
Semimanufactures	16,776	13,845	1,754	Japan 3,422; Singapore 2,306; New Zealand 1,784.
Chromium:				
Ore and concentrate	192	197	--	Philippines 193.
Oxides and hydroxides	76	66	12	West Germany 28; United Kingdom 19.
Cobalt:				
Oxides and hydroxides	26	26	1	China 20.
Metal including alloys, all forms	--	113	([2])	Canada 112.
Copper:				
Sulfate	NA	1,255	35	U.S.S.R. 684; United Kingdom 312.
Metal including alloys:				
Scrap	384	431	19	Singapore 200; Japan 168.
Unwrought	90	3,288	([2])	Zambia 3,196.
Semimanufactures	25,181	35,493	1,172	Japan 15,201; Australia 4,652; Taiwan 2,689.
Gold: Metal including alloys, unwrought and partly wrought --- troy ounces	103,502	97,802	43,228	Singapore 29,576; United Kingdom 17,045.

See footnotes at end of table.

Table 3.—Malaysia: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Iron ore and concentrate including roasted pyrite	25,113	33,497	--	India 33,397.
Metal:				
Scrap	54,878	25,465	22,305	Japan 1,923.
Pig iron, cast iron, related materials	13,250	12,005	12	Australia 8,159; China 3,340.
Ferroalloys	6,211	6,398	102	Japan 2,772; Australia 1,693; Norway 960.
Steel, primary forms	167,240	250,499	57	Japan 97,920; Taiwan 65,993; Poland 25,853.
Semimanufactures:				
Bars, rods, angles, shapes, sections	340,748	692,253	351	Japan 433,919; Taiwan 113,919; United Kingdom 30,830.
Universals, plates, sheets	569,167	655,586	2,403	Japan 452,567; Republic of Korea 78,976; Taiwan 29,855.
Hoop and strip	23,266	26,525	220	Japan 17,270; Brazil 4,827; Hong Kong 941.
Rails and accessories	10,471	12,956	28	Poland 7,409; United Kingdom 2,059; Taiwan 1,979.
Wire	18,896	25,034	192	China 7,304; Japan 5,800; Singapore 5,083.
Tubes, pipes, fittings	155,346	180,850	2,358	Japan 144,630; West Germany 15,160.
Castings and forgings, rough	3,305	4,398	9	Australia 1,051; China 749; Japan 745.
Lead:				
Oxides	588	355	3	Australia 270; West Germany 51.
Metal including alloys:				
Scrap	294	23	--	Singapore 22.
Unwrought	7,942	7,287	10	Australia 5,553; United Kingdom 1,208.
Semimanufactures	1,666	1,728	494	Australia 355; Singapore 313; Burma 239.
Manganese:				
Ore and concentrate	1,557	1,332	--	Singapore 1,300.
Oxides	1,730	2,006	1	Japan 1,300; Singapore 606.
Mercury 76-pound flasks	203	609	116	France 319.
Nickel: Metal including alloys:				
Scrap	2	1	1	
Unwrought	2,009	499	127	Japan 227; Belgium-Luxembourg 64.
Semimanufactures	269	610	8	Singapore 471; Japan 72.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	(3)	73,625	28,453	West Germany 28,582; United Kingdom 13,600.
Silver:				
Ore and concentrate[4] thousand troy ounces	NA	4,372	(2)	India 3,890.
Waste and sweepings[4] do	NA	32	(2)	Mainly from Hong Kong.
Metal including alloys, unwrought and partly wrought do	(5)	1,033	511	Japan 214; West Germany 112; Singapore 52.
Tin:				
Ore and concentrate	21,267	24,208	--	Australia 15,447; Bolivia 3,637; Laos 1,528.
Metal including alloys:				
Scrap	21	88	20	France 26; Japan 23.
Unwrought	573	1,038	354	Bolivia 402; Singapore 234.
Semimanufactures	99	68	22	Singapore 20; Hong Kong 16.
Titanium:				
Ore and concentrate	--	88	--	Australia 82.
Oxides	5,720	5,941	234	Australia 1,730; Japan 1,093; West Germany 1,090.
Metal including alloys, all forms	--	2	--	All from United Kingdom.
Uranium and/or thorium:				
Ore and concentrate	NA	1,381	--	Australia 1,361.
Metal including alloys, all forms	NA	15	--	Mainly from Australia.
Zinc:				
Ore and concentrate	45	52	--	Australia 49.
Oxides	178	152	1	West Germany 64; Singapore 20; France 19.
Metal including alloys:				
Scrap	463	110	--	Australia 48; Canada 40.
Unwrought	17,230	15,720	220	Australia 9,434; Canada 2,585; Japan 2,056.
Semimanufactures	920	1,191	1	Brazil 295; Australia 211; Japan 205.

See footnotes at end of table.

Table 3.—Malaysia: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Zirconium: Ore and concentrate	NA	147	--	Japan 118.
NONMETALS				
Asbestos, crude	35,645	24,632	2,437	Canada 12,221; Singapore 6,570.
Barite and witherite	22,939	16,651	150	Thailand 9,040; Singapore 6,152.
Cement thousand tons	960	1,175	(2)	Singapore 354; Japan 284; Taiwan 271.
Chalk	809	868	(2)	Japan 690; United Kingdom 115.
Clays, crude	38,937	36,119	10,309	West Germany 7,455; Singapore 2,908; United Kingdom 1,527.
Diamond:				
Gem, not set or strung value, thousands	$3,697	$4,697	--	Sierra Leone $1,563; United Kingdom $1,325; Belgium-Luxembourg $790.
Industrial do	$369	$86	$4	Singapore $81.
Diatomite and other infusorial earth	750	1,110	1,062	Japan 40.
Feldspar, fluorspar, related materials	17,275	12,260	2	India 7,184; China 1,994; Thailand 1,859.
Fertilizer materials: Manufactured:				
Ammonia	4,375	261	12	Indonesia 90; Singapore 66; Japan 35.
Nitrogenous	275,981	296,523	52,214	U.S.S.R. 82,007; Japan 73,156; West Germany 30,009.
Phosphatic	43,585	42,568	11,146	Jordan 24,242; Japan 4,137.
Potassic	254,704	330,457	24,957	Canada 114,341; U.S.S.R. 109,395; West Germany 56,611.
Unspecified and mixed	139,908	146,039	8,574	West Germany 87,994; Finland 19,557; Norway 14,494.
Graphite, natural	366	531	11	Japan 336; West Germany 71.
Gypsum and plaster	97,316	125,499	91	Thailand 123,227.
Lime	3,524	3,550	5	Singapore 1,822; Thailand 833; Taiwan 450.
Magnesite	3,008	2,429	9	Spain 1,328; Japan 726; China 189.
Mica:				
Crude including splittings and waste	73	83	30	United Kingdom 28; India 18.
Worked including agglomerated splittings	25	26	(2)	France 13; India 5.
Nitrates, crude	1,051	(2)	--	NA.
Phosphates, crude	219,165	208,008	400	Christmas Island 122,547; Jordan 37,490; Morocco 21,431.
Pigments, mineral: Iron oxides and hydroxides, processed	1,650	1,614	14	West Germany 847; United Kingdom 230; Japan 149.
Potassium salts, crude	2,055	312	--	All from West Germany.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$1,123	$663	$2	Hong Kong $196; Singapore $139; Japan $94.
Synthetic do	$3	$7	(2)	West Germany $3; Taiwan $3.
Salt and brine	134,799	131,504	447	Thailand 59,182; Australia 31,157; India 16,383.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	33,491	44,385	14,363	Kenya 21,905; Japan 3,037.
Sulfate, manufactured	NA	10,503	3,918	Japan 2,402; China 1,333; Taiwan 1,258.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	33,098	1,149	20	Italy 560; India 295.
Worked	2,490	4,016	19	Italy 2,214; China 707; Singapore 364.
Dolomite, chiefly refractory-grade	1,679	195	--	West Germany 149.
Gravel and crushed rock	29,318	3,763	(2)	Brunei 1,240; India 704; West Germany 632.
Limestone other than dimension	390	1,095	(2)	Republic of Korea 300; Singapore 179; Japan 107.
Quartz and quartzite	242	53	18	West Germany 14; Finland 11.
Sand other than metal-bearing	1,186	5,962	363	Thailand 4,839.
Sulfur:				
Elemental:				
Crude including native and byproduct	6,737	4,888	13	Singapore 4,014; West Germany 525.
Colloidal, precipitated, sublimed	7,036	6,237	21	Singapore 5,588; West Germany 221.
Sulfuric acid	606	438	32	Singapore 245; West Germany 95.
Talc, steatite, soapstone, pyrophyllite	7,613	5,073	3	China 2,579; Republic of Korea 1,631.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	11,839	32,426	22	Singapore 30,590.
Carbon: Carbon black	11,781	1,839	125	Thailand 816; Japan 354; Australia 328.

See footnotes at end of table.

Table 3.—Malaysia: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coal: All grades including briquets	102,986	106,732	10	Indonesia 78,933; Australia 18,704.
Coke and semicoke	41,488	29,537	11,221	Japan 12,874; Canada 2,625.
Petroleum:				
Crude thousand 42-gallon barrels	26,261	18,780	--	Saudi Arabia 12,139; Qatar 2,475; United Arab Emirates 2,368.
Partly refined 42-gallon barrels	--	672	--	China 482; Singapore 190.
Refinery products:				
Liquefied petroleum gas value, thousands	$17,662	$22,478	$17	Singapore $22,283.
Gasoline thousand 42-gallon barrels	5,438	5,534	3	Singapore 5,519.
Kerosine and jet fuel do	1,759	1,881	(2)	Singapore 1,880.
Distillate fuel oil do	9,119	10,513	(2)	Singapore 10,506.
Lubricants do	1,045	1,004	11	Singapore 844; Australia 81.
Residual fuel oil do	5,955	9,937	(2)	Singapore 9,147; Sri Lanka 453.
Bitumen and other residues do	191	279	(2)	Singapore 265.
Bituminous mixtures do	75	23	1	Singapore 18.
Petroleum coke do	41	--		

NA Not available.

[1] Table prepared by Audrey D. Wilkes.

[2] Less than 1/2 unit.

[3] Unreported quantity valued at $121,000.

[4] May include platinum-group metals.

[5] Unreported quantity valued at $1,409,000.

COMMODITY REVIEW

METALS

Aluminum.—Production of bauxite by Ramunia Bauxite Mining Co. from its open pit mine in the Pengerang area of southern Johor continued to decline. However, the exports of bauxite to Japan remained at about 420,000 tons. At an annual production rate of 500,000 tons, the ore reserves at Pengerang should last for another 10 years.

Copper.—Mine production remained at the same level as that of 1982. The Mamut Mine in Sabah produced 500,000 tons of ore per month and the mill head ore grade was about 0.55% copper with 19 grams of gold and 120 grams of silver per ton. The concentrator produced 10,200 tons of copper concentrate per month containing about 2,500 tons of copper metal. The copper recovery rate at the mill was about 89%. Overseas Mineral Resources Development Sabah Bhd. exported about 130,000 tons of copper concentrate to Japan.

MMC reportedly began intensive drilling for copper in the Maran area of Pahang State in late 1983. The $10 million project was to last 4 years.

Iron and Steel.—Iron ore output declined sharply in 1983. As a result of weak demand for iron ore, more closings of small mines were reported in the States of Perak and Johor. During the year, only one mine operated in Kedah producing about 30% of Malaysia's output, five mines in Perak produced 30%, and one mine in Johor produced 40%.

In October, Malaysia signed a $45 million contract with Brazil to import 1.5 million tons of iron ore pellets from Cia. Vale do Rio Doce (CVRD), Brazil's state mining company, under a countertrading arrangement. The iron ore pellets will be used for production of hot briquetted iron by the direct-reduction iron plant on Labuan Island of Sabah, which is scheduled for operation in May 1984. CVRD is to supply iron ore pellets at the rate of 300,000 tons per year over a 5-year period starting in February 1984.[4] The direct-reduction iron plant in Labuan requires 1.2 million tons of iron ore pellets annually. According to Government officials, negotiations for purchasing more raw materials were conducted with other iron ore pellet producers in Australia, Brazil, Peru, and Sweden during late 1983. In early 1982, Malaysia concluded a contract with India to import 250,000 tons of iron ore pellets annually over a 3-year period beginning in 1984.

Amalgamated Steel Mills (ASM), Malaysia's leading producer of steel bar and wire rod, commissioned its second rolling mill in early 1983. The combined annual capacity of ASM's rolling mills in Selangor was increased to 400,000 tons. The expansion of ASM's rolling capacity was supported by the Government through granting a 5-year tax holiday to the company and introduction of a ban on steel bar imports in late 1982.[5]

Tin.—Despite a relatively stable price of tin in the world market, mine production of tin declined by another 22% to 41,000 tons, the lowest level since 1960. The sharp drop in tin production was in part attributable to low prices of the metal and high production costs, but was largely a direct result of the export controls implemented by the 23-member ITC to combat the depressed world tin market. In 1983, the ITC agreed to increase export cutback to 39.6% from 36% (of 1981 export level) under the export-quota system that came into effect in April 1982.[6]

The impact of the ITC export controls have not only resulted in stabilizing the tin price but also in more closings of small gravel pump mines, massive layoffs of tin miners, and a substantial increase in tin smuggling during the 1982-83 period.

The average market price of tin in Penang in 1983 remained slightly above the floor price of $12.50 per kilogram set by the International Tin Agreement. However, a total of 165 mines were closed or shut down and 6,615 tin miners lost their jobs during a 12-month period ending in June 1983.

According to the statistics of Malaysia's Department of Mines, the total number of tin mines declined to 568 at the end of June 1983 from 733 at the end of June 1982. Of the mines closed, 145 were gravel pump operations, 17 were dredging operations, and 3 were other types. The number of workers employed in the tin industry decreased to 26,992 at the end of June 1983 from 33,707 at the end of June 1982. About 90% of the laid-off workers were in the States of Perak, Selangor, and Pahang where most gravel pump operations were located.

By November, MMC, the largest tin producer, announced that it would shut down two more dredges, which made 10 out of its 38 dredges idle, and layoff 770 employees as a result of tin export controls. Other tin companies involved in shutting down dredges and laying off workers included Killinghall Tin, Ayer Hitam, and Tronoh Mines Malaysia Bhd. According to Malaysia's National Mining Workers Union, about 12,500 workers have been laid off since August 1982, of which 10,000 were from gravel pump operations.[7]

Because of the ITC export restrictions, tin smuggling increased drastically and undermined the effectiveness of ITC's effort to balance supply and demand for tin in the world market. Based on a report by the ITC, an estimated 16,500 tons of tin metal was smuggled into the world market mainly from Thailand and Malaysia through Singapore during the period of August 1982 to July 1983. The ITC reportedly spent an extra $208 million to absorb the illegal tin for its price support program.[8]

To curb tin smuggling, several measures were taken by the Government in late 1983. These measures included a tenfold increase (to $30,000) in fines for illegal possession of tin, illegal delivery or making false declarations on tin, and increasing jail terms from 6 months to 2 years.

To ensure a greater stability of tin prices in the world market, Malaysia and the United States have drawn an accord in August for the United States to limit its tin disposal by the U.S. General Services Administration to no more than 3,000 tons per year for the 1983-84 period under the 1983 market conditions. However, the accord reportedly has not been ratified by Indonesia and Thailand.[9]

In June, a final agreement was signed by Malaysia, Indonesia, and Thailand in Bangkok to form the ATPC to stabilize tin prices and promote greater use of tin. The ATPC was officially established and became operational on August 16. After the first ministerial meeting of ATPC in Bangkok in late September, the association selected Kuala Lumpur for its headquarters and gave its first executive secretary post to an Indonesian official with an approved operating budget of $400,000 for 1984. Bolivia, Nigeria, and Zaire also joined the association in late 1983. These six countries control about 80% of the world's tin production. Australia sent an observer to the meeting but has not joined the association.[10]

During the first 9 months, Malaysia's exports of tin rose 23% to 45,481 tons from that of the same period in 1982. In 1982, Malaysia exported 48,575 tons of tin and earned $645 million in foreign exchange, accounting for 5.3% of the country's export earnings. During the 1982-83 period, most of Malaysia's tin exports went to Japan and the Netherlands.

Malaysia's tin metal consumption was boosted to about 600 tons in 1983, after Malaysia commissioned its first tinplate plant at Pasir Gudong in Johor in early 1982. The plant, with an annual capacity of

90,000 tons of tinplate, was built by Kawasaki Steel Corp. of Japan on a turnkey basis. Perstima, the plant operator, reportedly has requested the Government to restrict imports of tinplate into Malaysia.

Titanium.—Production of ilmenite by the amang (tin byproducts) plants rebounded to 190,000 tons in 1983 owing to increased exports. Beh Mineral Sdn. Bhd., the major producer, operated the largest amang plant on the outskirts of Ipoh in Perak. The plant received raw materials, rejects, and semiconcentrates from local dredging and gravel pump tin mining operations as well as importing tin tailings from Australia, China, Indonesia, and Thailand. In addition to ilmenite, the company also produced zircon, monazite, xenotime, struverite, cassiterite, and tourmaline for export mainly to Japan.

NONMETALS

Cement.—Production of cement remained at 3.1 million tons during 1982-83 while demand for cement in Malaysia continued to grow from 3.3 million tons in 1982 to 3.5 million tons in 1983. Malaysia remained a net importer of cement with Japan and Singapore as its major supplier.

Construction of a new cement plant on Langkawi Island in Kedah was rescheduled for completion in 1984. The project, which included a 4,000-ton-per-day coal-fired cement plant and port facilities for export of clinker to Singapore, was expected to cost $182 million. Kedah Cement Sdn. Bhd., the operator of the plant, is 50% owned by Heavy Industries Corp., 30% by the Kedah State Economic Development Corp., 10% by the Government of Singapore, and 10% by Nichirin Holdings.

Perak Hanjoong Cement Sdn. Bhd., a new cement company, was established in late 1982 to build a 1.2-million-ton-per-year cement plant in Padang Rengas in Perak. The $169 million plant is to be built by Korea Heavy Industries Construction Co. Ltd. on a turnkey basis. The plant is scheduled to come on-stream in 1985. Perak Hanjoong Cement is 60% owned by Hyundai Cement Co. Ltd. of the Republic of Korea and 40% by the Perak State Economic Development Corp.[11]

Tasek Cement Bhd. completed the conversion of its Ipoh plant from oil to coal in late 1982. However, the company's plan to expand the 1.2-million-ton-per-year plant by another 1.5 million tons per year was shelved indefinitely.

Fertilizer Materials.—ASEAN Bintulu Fertilizer Sdn. Bhd. (ABF) started construction on its $330 million ammonia-urea plant in Bintulu, Sarawak, in June. According to a company official, about 70% of the financing for the plant was secured from the Japanese Overseas Economic Cooperation Fund and the Export-Import Bank of Japan. Construction of the plant was undertaken by Kobe Steel Ltd. of Japan and the Friedrich Uhde GmbH of the Federal Republic of Germany.

Production of chemical fertilizer dropped to 350,000 tons in 1982-83 from 450,000 tons in 1980-81 owing to a sharp decline in consumption of phosphates by the rubber and palm oil sector. Chemical fertilizers produced in Malaysia were mostly nitrogen-phosphate-potassium compounds and ammonium sulfate, which fell 20% to 30% during 1981-82. Malaysia imports about 90,000 to 100,000 tons of P_2O_5 annually from Christmas Island, Jordan, and Morocco.

In November 1983, Malaysia became the first member of the Association of Southeast Asian Nations (ASEAN) to commit to import 100,000 tons of urea from ASEAN Aceh Fertilizer of Indonesia. The first shipment of 10,000 tons of urea reportedly arrived at Port Kelang in late 1983. The remaining 90,000 tons will be imported in 1984. Malaysia also imports annually about 60,000 tons of kieserite from the Federal Republic of Germany and the German Democratic Republic as well as 130,000 tons of potash from Canada, the German Democratic Republic, and the U.S.S.R.[12]

MINERAL FUELS

Coal.—MMC, the state-owned tin mining company and currently the sole importer of coal for domestic consumption, reportedly was considering a feasibility study to mine coal in Sarawak.

Consumption of steam coal rose substantially owing to the increased coal use in the cement industry that was completing its coal conversion program from oil to coal. Malaysia imported steam coal from Australia, China, and Indonesia. Coking coal for the iron and steel industry was imported mainly from Japan. Imports of steam and coking coal are expected to increase drastically when two 1-million-ton-per-year coal-fired cement plants, the Port Kelang coal-fired powerplant, and the expansion programs of iron and steel are completed in 1986.

Natural Gas.—Malaysia became an LNG exporting country for the first time in 1983. The first-stage production of LNG in Bintulu began in January and the first shipment of LNG carried by a vessel of the Malaysian International Shipping Corp. left Bintulu for Chibu, Japan, on January 29.

After more than 4 years of negotiation, a 20-year sale-and-purchase agreement was finally signed between Malaysia LNG Co., Tokyo Electric Power Co., and Tokyo Gas Co. of Japan in Kuala Lumpur on March 27. According to the agreement, Malaysia was to export 1.7 million tons of LNG to Japan in 1983 and gradually increase shipments to 6 million tons per year, when the three processing trains reach full capacity of 400,000 cubic feet daily in 1986. Tokyo Electric will take 4 million tons and Tokyo Gas will take 2 million tons each year.[13]

Malaysia's export earnings from LNG were estimated at $400 million, about $50 million less than originally estimated by Malaysian financial officials in 1982. The reduced earnings resulted from lower export prices of LNG, which were linked to a 15% cut in the price of Malaysian crude oil, and lower volume of LNG exports caused by a 6-week shutdown of the processing train owing to technical problems in early 1983.

According to industry sources, Japanese importers paid between $5.10 and $5.90 per million British thermal units for Malaysian LNG, and Malaysia missed two shipments of LNG to Japan during the year.

In February, a $220 million contract was awarded to a Japanese-American consortium for construction of six floating platforms, a 196-kilometer marine pipeline, and onshore gas-processing facilities to utilize natural gas discovered in the Samarang and West-Elul Gasfields offshore north to Labuan Island. The consortium consisted of Marubeni Corp. and Nippon Kokan K.K. of Japan and the Brown & Root Co. of the United States. The project was financed by a $53.3 million loan from the Japanse Overseas Economic Cooperation Fund and the remainder by a syndicated loan.

In March, an $84 million contract was awarded to Toyo Engineering Corp. and Mitsui & Co. of Japan by Petroleum National Bhd. (Petronas), the Malaysian state-owned oil company, for construction of a gas condensing and separating plant in Kerteh, Terengganu, and storage and shipping facilities in Chukai, Terengganu. The project was financed by a supplier's credit from the Export-Import Bank of Japan. Petronas also awarded a contract to Mitsui Engineering & Shipping Co. and Nichimen Corp. of Japan, and Novacorp Engineering Services of Canada to build a distribution pipeline system in Terengganu.

Petroleum.—Malaysia's crude oil production increased to an average of 380,000 barrels per day compared with an average of 303,000 barrels per day in 1982. Despite the reduction in oil price, Malaysia planned to increase its output of crude oil to near capacity at an average of 440,000 barrels per day in 1984.

In 1983, Malaysia exported about 85% of its low-sulfur crude oil production mainly to Japan, Singapore, and the United States. The average price of Malaysian crude dropped from $35.60 per barrel in 1982 to $30.04 per barrel as a result of the softening of oil prices in the world market. Export earnings from crude oil were estimated at $3.3 billion, accounting for 24% of Malaysia's export earnings.

Esso Production Malaysia Inc. (EPMI) reportedly erected four additional production platforms offshore Terengganu, which brought the number of its platforms in the area to 16.

In July, three Japanese firms—Japan Petroleum Exploration Co. Ltd., Teikoku Oil Co. Ltd., and Nippon Oil Exploration Co. Ltd.—reportedly joined the French petroleum company, Société Nationale Elf Aquitaine (SNEA), in developing Block III, a 12,650-square-kilometer area off Sarawak.

According to an agreement signed between SNEA and Petronas in November 1982, SNEA was to pay in cash 10% of its total production value to the Federal (5%) and Sarawak State (5%) Governments with the remaining 90% shared by Petronas and SNEA at a 70:30 split ratio, respectively. In addition, SNEA was allowed to claim 30% of the production for oil cost recovery or 35% for gas cost recovery during 5 years of exploration. If oil was discovered, SNEA would be given 4 years to develop the well and 15 years to carry out production work. If gas was discovered, SNEA would be given 5 years to find markets, 4 years to develop the gasfield, and 15 years to carry out production.[14]

In May, Petronas' first 30,000-barrel-per-day refinery and 140,000-barrel-per-day oil stabilization facility began operation at Kerteh in Terengganu. However, the planned oil refinery with a daily capacity of 120,000 barrels at Tunga Batu in Malacca was postponed for another 2 years because of excess refining capacity in the region and a shortage of national investment funds.

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[1] Economist, Division of Foreign Data.

[2] Where necessary, values have been converted from Malaysian dollars (M$) to U.S. dollars at the rate of M$2.32=US$1.00 in 1983.

[3] U.S. Embassy, Kuala Lumpur, Malaysia. State Dep. Airgram A-004, Jan. 1984.

[4] New Straits Times (Kuala Lumpur). Oct. 17, 1983, p. 18.

[5] Metal Bulletin (London). No. 6797, June 21, 1983, p. 29.

[6] Far Eastern Economic Review (Hong Kong). V. 122, No. 46, Nov. 17. 1983, pp. 92-93.

[7] Metal Bulletin (London). No. 6833, Nov. 15, 1983, p. 7. New Straits Times (Kuala Lumpur). Nov. 7, 1983, p. 19.

[8] Business Times (Kuala Lumpur). Oct. 5, 1983, p. 1.

[9] Metal Bulletin (London). No. 6814, Aug. 19, 1983, p. 9; No. 6831, Oct. 21, 1983, p. 11.

[10] The Asian Wall Street Journal. V. 7, No. 203, June 20, 1983, p. 3; V. 8, No. 23, Oct. 3, 1983, p. 8. Far Eastern Economic Review (Hong Kong). V. 122, No. 41, p. 12.

[11] Rock Products. Apr. 1983, p. 90.

[12] The British Sulphur Corporation. Phosphorus & Potassium, No.123, Jan./Feb. 1983, pp. 11-12.

[13] Tokyo Petroleum News. V. 23, No. 36, Mar. 29, 1983, p. 1.

[14] Oil and Gas Journal. V. 81, No. 18, July 11, 1983, p. 41. Sarawak Tribune (Kuching). Oct. 20, 1983, p. 1.

The Mineral Industry of Malta

By Walter G. Steblez[1]

Malta's mineral industry continued to produce lime, limestone, and salt in 1983. The country, lacking an industrial raw material base, relied on imports to satisfy most domestic needs. Mineral commodities, including petroleum refinery products, were bunkered and transshipped. The island's key position between north Africa and Europe provided favorable conditions for transshipment and reexport.

Major projects included continued work on the $110 million transshipment port at Marsaxlokk. The country's water shortage encouraged the Government of Malta to pursue the acquisition of water treatment and desalinization technology. Government policy also welcomed investment in the metallurgical, machinery, and other sectors of the economy, and, with the resolution of the boundary median line dispute with Libya in 1982, the Maltese Government reportedly offered a number of offshore production sharing contracts to foreign oil companies.

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[1] Foreign mineral specialist, Division of Foreign Data.

Table 1.—Malta: Production of mineral commodities[1]

Commodity	1979	1980	1981	1982[p]	1983[e]
Lime thousand metric tons	30	31	32	32	33
Limestone thousand cubic meters	400	400	410	410	415
Salt metric tons	500	550	540	530	550

[e] Estimated. [p] Preliminary.
[1] Table includes data available through June 1, 1984.

Table 2.—Malta: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1981	1982	Principal destinations, 1982
METALS			
Aluminum: Metal including alloys:			
Scrap	39	107	Italy 97.
Semimanufactures value	$583,290	$57,825	Italy $48,773; Netherlands $5,400.
Copper: Metal including alloys:			
Scrap	470	267	West Germany 68; United Kingdom 55; Denmark 51.
Semimanufactures value	$204,345	$242,623	Saudi Arabia $155,286; Denmark $43,856; Egypt $39,771.
Iron and steel: Metal:			
Scrap	3,728	6,366	Italy 5,973; Netherlands 342.
Pig iron, cast iron, related materials	1	13	All to Czechoslovakia.
Semimanufactures value	$28,813	$156,752	Saudi Arabia $143,011; United Kingdom $7,192.

Table 2.—Malta: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Principal destinations, 1982
METALS —Continued			
Lead: Metal including alloys:			
Scrap	125	107	Belgium-Luxembourg 103.
Semimanufactures value	$13	--	
Nickel: Metal including alloys:			
Scrap	7	4	United Kingdom 3.
Semimanufactures value	$899	$5,046	All to West Germany.
Silver: Metal including alloys, unwrought and partly wrought troy ounces	1,309	--	
Zinc: Metal including alloys, scrap	81	59	United Kingdom 24; Netherlands 17; Spain 17.
NONMETALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc. value	$7,065	--	
Dust and powder of precious and semiprecious stones excluding diamond do	--	$1,214	All to Belgium-Luxembourg.
Grinding and polishing wheels and stones do	$693,583	$569,746	Yugoslavia $348,039; West Germany $89,635.
Diamond: Gem, not set or strung value, thousands	$2,307	$3,287	All to Belgium-Luxembourg.
Fertilizer materials: Manufactured, unspecified and mixed	--	155	All to Italy.
Mica: Worked including agglomerated splittings value	$31,132	--	
Stone, sand and gravel: Dimension stone, worked do	$7,876	$8,982	Japan $6,459; United Kingdom $2,523.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Kerosine and jet fuel 42-gallon barrels	612,250	NA	
Distillate fuel oil[1] do	119,360	NA	
Lubricants do	[2]6,897	4,235	France 111; bunkers 4,124.
Residual fuel oil do	33,300	NA	

NA Not available.

[1] 1981 Yearbook of World Energy Statistics, United Nations, New York.

[2] Excludes unreported quantity valued at $1,188.

Table 3.—Malta: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides value	$10,017	$10,757	--	United Kingdom $4,798; France $3,841.
Metal including alloys, unwrought and semimanufactures value, thousands	[r]$4,000	$3,293	(1)	Italy $2,426; United Kingdom $435.
Chromium: Oxides and hydroxides value	$4,199	$6,100	--	All from United Kingdom.
Copper: Metal including alloys, unwrought and semimanufactures value, thousands	$3,836	$2,566	--	West Germany $1,735; United Kingdom $480.
Gold:				
Waste and sweepings value	$142,726	--		
Metal including alloys:				
Unwrought troy ounces	8,488	14,098	--	West Germany 10,600; United Kingdom 3,408.
Partly wrought value	$78,990	$135,484	--	Italy $104,974; West Germany $22,609.
Iron and steel: Metal:				
Scrap	1	190	--	France 162; West Germany 25.
Pig iron, cast iron, related materials	8,145	3,160	(1)	Greece 1,661; West Germany 1,293.
Ferroalloys, unspecified kilograms	6	--		
Steel, primary forms[2]	3,809	5,857	--	Spain 2,553; West Germany 1,654; Cuba 994.
Semimanufactures value, thousands	$20,497	$15,018	$229	Belgium-Luxembourg $3,363; Italy $1,871; United Kingdom $1,539.

See footnotes at end of table.

Table 3.—Malta: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides value	$151,914	$79,174	--	United Kingdom $61,467.
Metal including alloys:				
Unwrought	(1)	63	--	All from United Kingdom.
Semimanufactures value	$40,142	$114,643	--	United Kingdom $86,705; Belgium-Luxembourg $19,314.
Magnesium: Metal including alloys, all forms do.	$943	$3,385	--	West Germany $3,348.
Manganese: Oxides do.	$566	$585	--	All from United Kingdom.
Mercury do.	$1,932	$1,425	--	Do.
Nickel:				
Matte and speiss kilograms	200	--		
Metal including alloys, unwrought and semimanufactures value, thousands	$5,656	$7,620	--	West Germany $5,675; Ireland $1,163.
Platinum-group metals; Metals including alloys, unwrought and partly wrought troy ounces	5	--		
Silver: Metal including alloys, unwrought and partly wrought do.	39,638	11,593	--	United Kingdom 5,880; West Germany 5,185.
Tin: Metal including alloys, unwrought and semimanufactures value, thousands	$749	$958	--	Netherlands $590; United Kingdom $283.
Titanium: Oxides do.	$479	$360	$42	United Kingdom $149; Italy $128.
Tungsten: Metal including alloys, all forms value	--	$1,862	--	All from France.
Zinc:				
Oxides do.	$53,022	$33,645	--	Netherlands $17,389; West Germany $8,193.
Metal including alloys:				
Unwrought	174	139	--	Belgium-Luxembourg 61; Peru 25; Poland 25.
Semimanufactures value	$188,823	$144,857	--	Italy $106,319; France $29,138.
Other:				
Oxides and hydroxides do.	$40,862	$15,946	--	West Germany $9,885; United Kingdom $5,803.
Base metals including alloys, all forms do.	$10,673	$1,644	--	United Kingdom $1,615.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc. do.	$13,137	$23,873	$3,475	Belgium-Luxembourg $6,733; Italy $4,303; United Kingdom $3,555.
Artificial: Corundum do.	$43,651	$55,174	--	Yugoslavia $41,799; Poland $11,534.
Dust and powder of precious and semiprecious stones including diamond do.	$31,928	$14,501	--	Ghana $7,394; Belgium-Luxembourg $7,107.
Grinding and polishing wheels and stones do.	$556,821	$399,810	$1,658	West Germany $113,028; Yugoslavia $93,920; Italy $91,284.
Asbestos, crude do.	$38,673	$2,941	--	Italy $2,819.
Barite and witherite do.	$398	$794	--	All from United Kingdom.
Boron materials: Oxides and acids do.	$1,609	$61	--	All from West Germany.
Cement	142,170	185,947	NA	NA.
Chalk value	$61,735	$77,450	--	United Kingdom $34,959; France $20,084.
Cryolite and chiolite do.	$4,558	$680	--	All from Yugoslavia.
Diamond:				
Gem, not set or strung value, thousands	$6,201	$5,499	--	Angola $1,494; Switzerland $1,389; Ghana $909.
Industrial do.	$1,827	$501	--	Ghana $336; Belgium-Luxembourg $165.
Diatomite and other infusorial earth value	$31,028	$15,407	--	Spain $10,016; West Germany $3,480.
Fertilizer materials:				
Crude, n.e.s	1	--		
Manufactured:				
Ammonia value	$26,603	$34,670	--	United Kingdom $28,143; Netherlands $4,529.
Nitrogenous	887	501	--	Italy 304; West Germany 148.
Phosphatic	21	46	18	Belgium-Luxembourg 18; United Kingdom 10.

See footnotes at end of table.

Table 3.—Malta: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials —Continued				
Manufactured —Continued				
Potassic	--	18	--	All from United Kingdom.
Unspecified and mixed	341	546	2	West Germany 275; Italy 234.
Gypsum and plaster value	$41,624	$36,625	$4,980	Spain $25,978; United Kingdom $2,792.
Lime	130	437	--	Italy 432.
Magnesite value	--	$355	--	All from United Kingdom.
Meerschaum, amber, jet do	$408	$27	--	Do.
Mica:				
Crude including splittings and waste do	$2,812	$6,714	--	United Kingdom $4,269; Netherlands $2,445.
Worked including agglomerated splittings do	$121,079	$97,053	--	West Germany $88,056; United Kingdom $5,107.
Pigments, mineral:				
Natural, crude do	--	$6,053	--	United Kingdom $5,750.
Iron oxides and hydroxides, processed do	$14,923	$11,612	--	Spain $6,313; United Kingdom $2,331.
Precious and semiprecious stones other than diamond:				
Natural do	$12,635	$51,577	--	Ghana $46,235.
Synthetic do	$279	$699	--	West Germany $408; Thailand $291.
Salt and brine[3]	2,163	1,776	NA	Italy 750; Tunisia 520; United Kingdom 502.
Sodium compounds, n.e.s.: Carbonate, natural and manufactured	275	321	--	West Germany 300; Denmark 18.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked value, thousands	$1,774	$1,630	--	Italy $1,505; Spain $106.
Worked value	$36,480	$69,177	--	Italy $65,532; United Kingdom $2,584.
Gravel and crushed rock do	$557,777	$616,646	--	Italy $604,568.
Quartz and quartzite do	$2,443	$2,569	--	All from Italy.
Sand other than metal-bearing[4]	1,912	1,068	--	Italy 948.
Sulfur:				
Elemental:				
Crude including native and byproduct	2	95	--	All from Italy.
Colloidal, precipitated, sublimed	91	220	--	Italy 214.
Dioxide value	--	$226	--	All from Italy.
Sulfuric acid do	$58,773	$112,030	--	Italy $57,143; Netherlands $30,265.
Talc, steatite, soapstone, pyrophyllite do	$40,098	$26,562	--	Norway $14,317; United Kingdom $5,410.
Other: Crude do	$4,347	$5,706	$2,686	Yugoslavia $1,217; United Kingdom $923.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,005	4	1	West Germany 2.
Carbon: Carbon black value	$225,659	$314,027	$31,164	Italy $182,591; West Germany $69,009.
Coal:				
Anthracite and bituminous	677	24,343	--	Poland 24,336.
Briquets of anthracite and bituminous coal	32	34	--	Mexico 31.
Petroleum:				
Crude value	--	$131	--	All from Kuwait.
Refinery products:				
Liquefied petroleum gas[5] 42-gallon barrels	139,200	NA		
Gasoline, motor[5] do	340,000	NA		
Mineral jelly and wax[6] do	2,380	2,369	(1)	United Kingdom 1,920; West Germany 284.
Kerosine and jet fuel[5] do	612,250	NA		
Distillate fuel oil[5] do	477,440	NA		
Lubricants[7] do	19,236	21,668	112	United Kingdom 6,107; Netherlands 5,261; Italy 3,940.
Nonlubricating oils value	$68,188	--		

See footnotes at end of table.

Table 3.—Malta: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Residual fuel oil 42-gallon barrels	1,698,300	NA		
Bitumen and other residues do	29	7	--	All from West Germany.
Bituminous mixtures value	$108,110	$107,603	--	United Kingdom $75,498; France $16,568.

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[r] Revised. NA Not available.

[1] Less than 1/2 unit.

[2] Excludes unreported quantities valued at $666 in 1981 and $24,178 in 1982.

[3] Excludes unreported quantities valued at $59,341 in 1981 and $64,134 in 1982, of which $449 was imported from the United States.

[4] Excludes unreported quantities valued at $253 in 1981 and $1,923 in 1982.

[5] 1981 Yearbook of World Energy Statistics, United Nations, New York.

[6] Excludes unreported quantities valued at $14,401 in 1981 and $7,202 in 1982.

[7] Excludes unreported quantities valued at $285,843 in 1981 and $203,911 in 1982, of which $8,584 was imported from the United States.

The Mineral Industry of Mauritania

By Thomas O. Glover[1]

The iron ore mining industry has performed a central role in the Mauritanian economy for the past two decades. Iron ore exports, representing 80% of Mauritania's foreign currency earnings, have been gravely curtailed by the downturn in the world steel manufacturing industry.[2]

After recovering from the damage inflicted in the mid-1970's on the iron ore mining sector by the conflict in Western Sahara, output has fallen short of production capacity and targets. Given Mauritania's dependence on iron ore exports, its economy was adversely affected by the weakness of the iron ore market in 1983.

Export volume of iron ore decreased, which caused a balance-of-payments crisis. The balance-of-payments crisis, combined with general economic problems, has led to an economic stabilization program approved by the International Monetary Fund. Owing to conditions stated above, the Government pursued a policy of promoting new investment in mining. Thirty-three percent of projected investment expenditures in the 1981-85 economic plan period have been allocated to the mining sector.

PRODUCTION AND TRADE

Production of Mauritania's major mineral commodity, iron ore, continued to decline for the fourth year in succession, owing mostly to poor market conditions. Iron ore output was down more than 10% from that of 1982 and barely above the low of 6.9 million tons in 1978, when the conflict with Western Sahara was at its peak. The refurbished oil refinery at Nouadhibou, operating on Algerian crude oil, was in its second year of operation. Iron ore exports from the Government-owned Société Nationale Industrielle et Minière (SNIM) mines in Zouirat in 1983 totaled 7.4 million tons. The three major countries receiving Mauritanian iron ore were Belgium, France, and Italy. Other countries receiving Mauritanian iron ore were the Federal Republic of Germany, Japan, Spain, and the United Kingdom. Japan purchased only 443,000 tons of iron ore from Mauritania in 1983 compared with 708,000 tons in 1982. In 1982, the 7,653,000 tons of iron ore exported included 4,940,000 tons of high-grade ore averaging 63.5% iron and 2,713,000 tons of siliceous ore averaging 56.3% iron. The average value of iron ore exported from Nouadhibou in 1982 was $19.14 per ton.

SNIM's goal was to line up as many long-term contracts as possible for the Guelbs iron ore prior to mining. All of the 3 million tons scheduled for the El-Rhein Mine's first year production startup was under contract. The contracts were with Arab states in the Persian Gulf.

Table 1.—Mauritania: Production of mineral commodities[1]

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
Cement, hydraulic metric tons	--	--	60,000	[3]60,000	60,000
Gypsum do.	16,051	12,025	[4]1,732	[e]5,000	4,000
Iron and steel:					
Iron ore:					
Gross weight thousand metric tons	9,373	8,936	8,704	[3]8,255	7,400
Iron content[e] do.	5,811	5,332	5,243	4,750	4,250
Metal:					
Steel, crude metric tons	6,200	5,098	--	[3]6,823	7,000
Semimanufactures do.	--	3,995	4,400	[3]10,391	10,000
Rare-earth metals: Monazite concentrate, gross weight[e] do.	100	--	--	--	--

[e]Estimated. [p]Preliminary.

[1]Table includes data available through May 3, 1984.

[2]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, stone, and sand and gravel) and salt presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Gypsum mine only operated Jan.-Mar. 1981.

COMMODITY REVIEW

METALS

Copper.—The Akjoujt copper deposits are located approximately 280 kilometers northeast of Nouakchott, the capital of Mauritania. The deposits are owned by the Government of Mauritania through two state companies, Société Cuivre de Mauritanie and Société des Mines du Cuivre de Mauritanie. In 1965, exploration results indicated the deposits contained approximately 24 million tons of sulfide ore and 8 million tons of oxide ore containing 1.83% copper and 2.66% copper, respectively. The mine and plant designed capacities were 2,000 tons per day of sulfide ore and 1,000 tons per day of oxide ore. The sulfide ores occurred as pyrrhotite, chalcopyrite, and cubanite. The mining operation of copper ore started in 1970 and closed in 1978 after having produced over 98,000 tons of copper metal. The mine was closed in mid-1978, mainly because of increased fuel prices, the low international prices of copper, and problems with the treatment of refractory copper ore (TORCO) process. The mine, reported to have been reactivated in 1982, remained closed in 1983. Depressed copper prices and the possible lack of finance are possibly the reasons for not reactivating the mine.

Iron Ore.—The outlook was far from bright for the Mauritanian iron ore industry. The slowdown in iron ore exports came in the middle of launching the first phase of the Guelbs iron ore development scheme, which was designed to boost production capacity to 15 million tons per year. The three mines in production are the Tazadit, F'Derik, and Rouessa, all open pit mines in the Kedia d'Idjill deposit near the town of Zouirat. All three are scheduled to be phased out by 1990 and will be replaced by mines operating in the Guelbs deposit. The Guelbs deposit is 40 kilometers north of Zouirat. The mines in the Kedia d'Idjill deposit have been in operation for two decades and are nearing exhaustion of their high-grade ore, which averaged 65% to 67% iron. The Guelbs deposit is considered low-grade ore, grading 35% to 37% iron.

Mining at the $350 million[3] El-Rhein project was due to commence at the end of 1984 at 3 million tons of iron ore per year and rise thereafter to a steady 6 million tons per year. During a second phase, near the end of the 1980's, the Oum Arwagen site was to be exploited at the same rate. A concentrator plant was also being built to upgrade the low-grade iron ore.

Total investment at the El-Rhein Mine has been reduced considerably owing to a reduction in capital equipment investments. Loans for the project were provided by Abu Dhabi, France, Iraq, Japan, Kuwait, Saudi Arabia, the African Development Bank, and the special fund of the Organization of Petroleum Exporting Countries.

NONMETALS

Gypsum.—Mauritania had mined gypsum at Sebkha de Ndrhamcha, near Nouakchott, for nearly a decade. The entire production of gypsum, prior to the shutdown of mining in April 1981, was sent to Senegal for making cement. Mauritania possesses an estimated reserve of 1 billion tons of 98%-pure gypsum.

Phosphate.—Possibilities appear brighter for the phosphate deposits at Bofal located close to the Senegal River approximately 350 kilometers from the coast. Reserves at Bofal have been estimated at 120 million tons of 22% phosphate rock. It was felt that further prospecting by a consortium, including SNIM, Bureau de Recherches Géologiques et Minières (France), GEOMIN (Romania), and Société Sénégalaise des Phosphates de Thies (Senegal), could boost known reserves to over 150 million tons. Development of the transportation infrastructure needed to export the phosphate rock is expected to be a major obstacle to the exploitation of the deposits.

MINERAL FUELS

Mauritania has as yet no domestic production of crude oil; however, areas have now been leased to companies for exploration. Both Oxoco International and Mobil Oil Corp. are parties to the leasing. Oxoco leased a 20,000-square-kilometer onshore area that starts south of Nouakchott and covers the land mass along the Senegal River up to Leggah. Oxoco was to carry out seismic studies during a 2-year period and then drill an exploration well. Mobil acquired a lease covering a 28,000-square-kilometer offshore block west of Nouakchott. Mauritania was negotiating with other companies on additional exploration leases. Mauritania's only refinery, National Refining Industry of Mauritania, near Nouadhibou, was operating on imported Algerian crude petroleum. The refurbished refinery still had operational problems.

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[1] Physical scientist, Division of Foreign Data.

[2] Schissel, H. Mauritania: Mining Sector Analyzed. West Africa (London), No. 3456, Nov. 7, 1983, pp. 2563-2564.

[3] Where necessary, values have been converted from Mauritanian ouguiyas (UM) to U.S. dollars at the rate of UM55.003 = US$1.00.

The Mineral Industry of Mexico

By Orlando Martino[1]

Traditionally, Mexico has been a major world producer and trader of metallic and industrial minerals and, until 1974, was only a marginal crude oil exporter. Because of large oil discoveries and growth of productive capacity since that time by state-owned Petróleos Mexicanos (PEMEX), Mexico became a major world producer and exporter of crude oil. In 1983, Mexico continued in fourth rank as a world oil producer after the U.S.S.R., the United States, and Saudi Arabia. PEMEX's success in exploiting the country's large hydrocarbon resources can be appreciated when it is noted that as recently as 1979 Mexico ranked 15th in world production.

After a period of remarkable expansion, PEMEX did not establish another record high in oil output, but because of reduced domestic demand from the worsened economic recession, a historic level was achieved in total crude oil exports during 1983. Mexico continued as the most important foreign oil supplier to the United States and widened its share of the U.S. market. An active exploration program brought a small increase to Mexico's proven hydrocarbon reserves to 72.5 billion barrels, thus confirming its fifth position in world oil reserves.

PEMEX was the largest operating company in Mexico and Latin America and ranked 12th among the 200 largest foreign companies in terms of revenues. As of December, PEMEX had assets valued at almost $39 billion, revenues of about $21 billion, and net income of $6.7 billion.[2] Despite a 4.7% decline in the gross domestic product to an estimated $170 billion at current prices, Mexico's nonfuel mineral industry achieved increased output in a number of minerals in response to higher world prices and improving demand in the industrialized countries. But overall national income from the extractive industries including oil and natural gas dropped 2.2%.

From expanded mining capacity of well-established producers and full-capacity operation of the new Real de Ángeles open pit mine, Mexico succeeded in solidifying its position as the world's leading silver producer and refiner. In addition to silver, Mexico was a major world producer of antimony, arsenic, bismuth, fluorspar, sodium carbonate, and strontium minerals, and a significant producer of copper, diatomite, natural graphite, feldspar, lead, mercury, and zinc. Mexico's mineral industry was characterized by a wide diversity of metallic and industrial minerals in addition to coal, natural gas, and oil. The country produced 17 metallic minerals and 28 industrial minerals and exported varying amounts of most of them. Mexico thus enjoyed self-sufficiency in a large number of minerals and generated a surplus to give it status as an important world trader.

Mexico's mixed economy was reflected in its mineral industries where the private mining companies contributed 49% of mining output, basically in precious and industrial metals, and parastate companies contributed 39%, chiefly in minerals with strategic significance for the economy.

Financial operations of the major mining companies such as Mexicana de Cobre S.A., Cía. Minera de Cananea S.A., Industrias Peñoles S.A. de C.V. (PEÑOLES), and México, Desarrollo Industrial Minera S.A. (MEDIMSA) continued to benefit from the progression of peso devaluations during the year. Since most of the major mining companies exported a large part of their mineral output, earnings of hard currencies enabled them to counteract the impact of Mexico's 81% inflation rate. But by yearend, local currency costs of labor and local materials had increased notably. MEDIMSA's exports were 60% of total sales. MEDIMSA's sales to the United States were 38% of its total export sales. PEÑOLES' export sales were 65% of the total with 50% placed in the United States.

In August, Cámara Minera de México (CAMIMEX), the industry association for the mineral sector, which also has Government members and was created by an act of law, established a permanent committee to study the capital goods needs and the inputs of Mexico's mining industry. The fundamental objective of the study is to obtain a better understanding of the capacity of the country to produce the material inputs, possibilities for substituting imports, establish quality standards, and form a data bank for the use of the associated companies. With respect to the data bank, CAMIMEX has received questionnaires from mining companies representing 80% of national output. Survey forms have been received from 747 suppliers that have permitted the analysis of 137 inputs, especially regarding underground mining and beneficiation plants. CAMIMEX is also studying financial mechanisms to facilitate imports of items not produced in Mexico and the feasibility of promoting service stations to repair imported capital equipment. Foreign mining equipment was estimated by CAMIMEX to comprise 40% to 45% of the total used in Mexico.

Government Policies and Programs.—Under the scope of the National Development Plan (1983-88), the Secretary of Energy, Mines, and Parastate Industries was preparing a National Mining Plan with production and investment goals along with financial mechanisms. Mexico's new National Energy Plan was also under preparation.

At yearend, it was not yet clear how and when the Government's equity in two large mining companies, Minera Real de Ángeles S.A. de C.V. and Frisco S.A. de C.V., which were acquired through the September 1982 bank nationalization, would be disposed. Frisco and Real de Ángeles were excluded in the Government's first package stock auctions for former owners and other private investors. Officials at Frisco remained confident that the firm will be returned to private ownership.

Two major tax changes were made concerning the mineral industry and several other legal and fiscal modifications. The mineral production tax was eliminated. It was substituted by a new "right-to-exploit" payment equal to 7% of the net smelter value for gold, silver, and sulfur (the previous production tax was 9%); 2% for iron and manganese (previously 4%); and 5% for all other minerals (previously 7%). The 2% subsidy allowed for exploration and mine development work was also eliminated. The second tax change raised the dividend tax from 21% to 55%. Dividends must now be declared as income to the receiver, but 100% of the dividend tax paid can be claimed as a tax credit on income taxes. Companies currently declare dividend payments as operating expenses. Effective in 1984, accelerated depreciation up to 75% of asset value can be taken for new plants or expansions.

PRODUCTION

After reaching record-high levels in 1982, production of crude oil and natural gas decreased moderately in response to lower domestic and international demand. With respect to nonfuel minerals, production results were mixed. Of the 14 important mineral commodities that account for the major part of the value of Mexico's mining-metallurgical output, output of 6 was higher—antimony, gold, lead, molybdenum, silver, and zinc—and 8 had lower output—aluminum, barite, coke, mine copper, fluorspar, iron ore, manganese, and sulfur.

Output of gold rebounded in response to improved world prices, while mine output of silver continued its upward trend because of new mine capacity as well as higher world prices. The decline of steel production and related mineral inputs such as iron ore and manganese reflected the depressed activity in construction, automobile manufacture, and metal fabrication. The rise to historic levels of coal production was due to expanded demand for steam coal to feed new installations of thermal electric generating units.

The changes in the relative importance of the several mineral groups in the value of Mexico's total nonfuel mineral production are shown below:

Mineral group	Percent share	
	1982	1983
Precious metals	35.3	45.1
Nonferrous metals	41.1	36.1
Ferrous metals	10.2	8.5
Nonmetallics	13.4	10.3
Total	100.0	100.0
Precious metals:		
Gold	29.6	39.6
Silver	5.7	5.5
Nonferrous metals:		
Copper	20.0	17.6
Zinc	10.5	11.6
Lead	4.5	3.6
Ferrous metals:		
Iron	6.6	6.6
Manganese	1.8	1.1
Nonmetallics:		
Sulfur	7.7	6.0
Fluorspar	4.0	2.9

Considering Mexico's economic recession, total employment increased surprisingly from 206,000 in 1982 to 211,000 in 1983. This, however, was in line with the total volume of mine output that increased 6% during the year, according to data of the Government's Dirección General de Minas. PEMEX was the most important employer in the mineral sector with over 150,000 workers. Among the large private companies, MEDIMSA employed 14,050 workers; PEÑOLES, 11,700; and Frisco, 3,670.

Table 1.—Mexico: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum metal:					
Primary	43,195	42,601	43,237	41,180	39,706
Secondary	14,921	17,111	20,341	25,770	15,722
Antimony:					
Mine output, metal content[3]	2,872	2,176	1,800	1,565	2,519
Metal (in mixed bars and refined)	557	422	354	253	1,782
Arsenic, white[4]	6,537	[r]6,932	6,517	4,740	4,557
Bismuth[5]	754	770	656	606	545
Cadmium:					
Mine output, metal content	1,778	1,791	1,433	1,444	1,341
Metal, refined	830	778	590	607	642
Copper:					
Mine output, metal content[6]	100,809	184,123	232,902	229,179	195,959
Metal:					
Blister (primary only)	83,857	85,610	69,199	77,373	91,994
Refined:					
Primary	71,781	74,610	61,301	61,424	80,903
Secondary[e]	10,000	11,000	10,000	14,000	15,000
Total[e]	81,781	85,610	71,301	75,424	95,903
Gold:					
Mine output, metal content troy ounces	190,364	195,991	203,160	196,248	222,804
Metal, refined do.	187,439	185,863	176,861	175,189	177,504
Iron and steel:					
Iron ore:					
Gross weight[7] thousand tons	6,061	7,631	8,020	8,155	8,040
Metal content do.	4,041	5,087	5,293	5,382	5,306
Metal:					
Pig iron do.	3,520	3,639	3,767	3,598	3,538
Sponge iron do.	1,507	1,636	1,686	1,505	1,497
Total do.	5,027	5,275	5,453	5,103	5,035

See footnotes at end of table.

Table 1.—Mexico: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS —Continued					
Iron and steel —Continued					
Metal —Continued					
Ferroalloys:					
Ferromanganese thousand tons	123	122	131	135	143
Silicomanganese do.	31	31	26	31	45
Ferrosilicon do.	24	27	23	24	24
Ferrochromium do.	5	--	3	6	3
Other do.	1	1	2	1	1
Total do.	184	181	185	197	216
Steel, crude do.	7,117	7,156	7,663	7,056	6,948
Semimanufactures do.	5,844	6,220	6,395	5,652	5,318
Lead:					
Mine output, metal content[8]	158,786	147,176	148,916	170,172	184,261
Metal:					
Smelter:					
Primary	172,988	144,968	156,677	145,382	166,800
Secondary (refined)[e]	50,000	44,000	38,000	34,000	35,000
Total	222,988	188,968	194,677	179,382	201,800
Refined:					
Primary (including lead content of antimonial lead)	167,149	140,294	150,550	129,238	162,461
Secondary[e]	50,000	44,000	38,000	34,000	35,000
Total	217,149	184,294	188,550	163,238	197,461
Manganese ore:					
Gross weight[9]	492,664	447,128	578,300	509,000	350,000
Metal content	177,359	160,966	208,193	183,120	133,004
Mercury, mine output, metal content 76-pound flasks	1,973	4,206	6,962	8,558	6,411
Molybdenum, mine output, metal content	48	74	451	5,190	5,866
Nickel, mine output, metal content	1	--	--	--	--
Selenium, elemental	75	46	12	29	24
Silver:					
Mine output, metal content[8] thousand troy ounces	52,169	50,052	52,916	59,175	63,607
Metallurgical products, metal content do.	48,601	45,410	50,151	46,784	58,544
Tin:					
Mine output, metal content	23	[r]60	28	27	50
Metal, smelter, primary	1,268	[r]1,322	838	944	1,216
Tungsten, mine output, metal content	252	266	263	194	186
Zinc:					
Mine output, metal content[8]	242,933	235,823	206,569	242,332	266,292
Metal, smelter, primary	161,723	143,868	126,537	126,953	175,655
NONMETALS					
Asbestos	--	--	--	200	NA
Barite	151,162	269,322	317,738	363,753	357,043
Cement, hydraulic thousand tons	15,178	16,260	18,066	19,298	16,850
Clays:					
Bentonite	169,848	176,028	220,454	184,918	171,140
Fuller's earth	48,820	56,858	65,378	42,217	41,574
Kaolin	76,994	271,041	207,824	172,390	162,000
Common	149,000	153,472	277,766	249,069	213,775
Diatomite	43,606	56,352	56,600	56,342	43,967
Feldspar	110,869	117,214	130,826	115,559	117,518
Fluorspar:[10]					
Acid-grade thousand tons	NA	492	508	409	407
Ceramic-grade do.	NA	104	108	54	46
Metallurgical-grade do.	NA	300	307	166	73
Submetallurgical-grade do.	NA	210	193	106	79
Total do.	875	1,106	1,116	735	605
Graphite, natural:					
Amorphous	50,880	44,506	41,142	34,370	42,669
Crystalline	--	348	1,152	1,804	1,658
Gypsum and anhydrite, crude (yeso)	2,021,006	2,170,669	2,390,431	2,042,484	2,958,085
Lime (cal) thousand tons	4,579	4,350	4,500	4,000	3,630
Magnesium compounds:[11]					
Magnesite	[e]18,000	15,865	12,117	22,492	23,187

See footnotes at end of table.

Table 1.—Mexico: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Magnesium compounds:[11] —Continued					
Magnesia	63,620	71,122	68,578	64,605	66,300
Mica, all grades	243	[r]3,600	2,077	510	1,560
Nitrogen: N content of ammonia[12]	1,358,800	1,547,971	1,795,647	2,029,800	1,935,500
Perlite	41,988	44,379	56,731	32,425	41,377
Phosphate rock	274,428	396,646	503,252	653,050	785,038
Salt, all types thousand tons	6,169	6,575	7,953	5,561	5,703
Sodium compounds:					
Soda ash (sodium carbonate), natural and synthetic do.	420	406	401	390	400
Sodium sulfate (bloedite), natural	361,123	372,092	423,410	128,079	150,000
Stone, sand and gravel:					
Calcite, common	109,138	226,882	246,040	234,694	344,793
Dolomite	282,342	378,316	371,027	353,265	285,151
Limestone[13] thousand tons	24,086	31,173	39,046	40,880	35,276
Marble	155,578	164,392	171,152	119,759	149,086
Quartz, quartzite, glass sand (silica)	537,299	892,963	1,009,330	828,187	929,059
Sand and gravel:					
Sand thousand cubic meters	NA	51,033	56,392	60,339	50,987
Gravel do.	NA	33,048	36,518	39,074	33,018
Strontium minerals (celestite)	39,519	40,761	41,344	31,676	37,506
Sulfur, elemental:					
Frasch process thousand tons	1,773	1,700	1,652	1,391	1,225
Byproduct:					
Of metallurgy[e] do.	100	115	100	100	100
Of natural gas do.	252	402	426	425	377
Total do.	2,125	2,217	2,178	1,916	1,702
Talc	7,835	10,088	13,733	12,270	15,092
Vermiculite[14]	--	545	596	522	399
Wollastonite	11,892	14,400	14,602	15,599	10,784
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	270,082	280,039	335,906	328,763	381,425
Coal, run-of-mine:					
Metallurgical coal thousand tons	7,293	6,602	6,849	6,833	7,181
Steam coal do.	64	408	1,237	786	1,818
Total do.	7,357	7,010	8,086	7,619	8,999
Coke:					
Metallurgical do.	2,974	2,845	3,031	2,433	2,425
Imperial do.	13	16	12	9	9
Breeze do.	65	91	90	8	8
Total do.	3,052	2,952	3,133	2,450	2,442
Gas, natural:					
Gross million cubic feet	1,064,559	1,298,581	1,482,196	1,549,921	1,479,560
Marketable do.	914,873	1,129,288	1,214,240	1,279,398	1,274,465
Natural gas liquids:					
Field condensate thousand 42-gallon barrels	3,597	139	309	654	8,300
Other do.	53,644	70,791	88,145	NA	NA
Petroleum:					
Crude do.	533,329	708,454	843,933	1,002,430	972,922
Refinery products:					
Gasoline:					
Aviation do.	638	622	544	653	420
Other do.	102,888	118,855	130,559	126,410	129,230
Jet fuel do.	9,154	10,089	10,558	11,177	9,998
Kerosine do.	14,698	15,164	15,047	16,541	14,258
Distillate fuel oil (diesel) do.	78,584	89,392	98,530	84,254	81,745
Residual fuel oil do.	86,684	112,903	126,665	127,621	127,819
Lubricants do.	2,836	2,860	3,512	2,854	2,402
Liquefied petroleum gas do.	33,058	43,829	49,595	55,042	56,539
Asphalt do.	5,390	6,155	6,651	7,288	6,185
Unspecified do.	7,690	6,656	7,543	7,541	9,430

See footnotes at end of table.

Table 1.—Mexico: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum —Continued					
Refinery fuel and losses thousand 42-gallon barrels	16,647	18,478	21,856	22,478	28,951
Total do	358,267	425,003	471,060	461,859	466,977

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Aug. 31, 1984.

[2]In addition to the commodities listed, pumice and additional types of crude construction materials are produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3]Sb content of ores for export plus Sb content of antimonial and impure bars plus refined metals.

[4]Calculated white As equivalent of metallic As content of products reported.

[5]Refined metal plus Bi content of impure smelter products.

[6]Copper mine output series revised beginning with 1979 to show actual mine output. Prior published data for mine output was derived from data on refined products and concentrates.

[7]Calculated from reported Fe content on the basis of concentrate and pellets containing 66% iron. Total run-of-mine output in 1983 was just under 14 million tons.

[8]Production series modified, beginning with 1979, according to available detail data on mine output per municipality and State.

[9]Calculated from reported Mn content of mine production on the basis of ore and nodules averaging 38% manganese.

[10]Beginning with 1979, revised data is obtained from the Instituto Mexicano de la Fluorita A.C.

[11]Reported erroneously as magnesite in previous editions of this chapter covering the years 1977-82. The output of magnesite for 1977 and 1978 is 3,528 tons and 23,085 tons, respectively.

[12]Beginning in 1981, Petróleos Mexicanos initiated production of liquid nitrogen, which in that year amounted to 29,540 tons; in 1982, it was 39,009 tons, and in 1983, 44,971 tons.

[13]Excluding that for cement production.

[14]First year of production registered for vermiculite by Consejo de Recursos Minerales was in 1980.

TRADE

Mexico's foreign exchange earnings from exports of crude oil declined from that of 1982 because of weakness in world oil prices. However, reduced domestic demand made it possible to modestly increase the volume of crude oil exports to 561 million barrels. Crude oil exports were 58% of total output. The United States continued as Mexico's major market, taking 53% of all crude oil exports. Spain, Mexico's second largest oil customer, was expected to increase purchases of Mexican crude from 160,000 barrels per day in 1983 to 180,000 barrels per day in 1984. The dominance of crude oil in Mexico's international trade is shown below:

	1980	1981	1982	1983
Total Mexican exports value, millions	$15,308	$19,379	$21,006	$21,400
Crude oil exports do	$9,449	$13,305	$15,623	$14,821
Crude oil share percent	61.7	68.7	74.4	69.3
Mining, metallurgical exports value, millions	$1,347	$1,256	$887	$1,018
Mining, metallurgical share percent	8.8	6.5	4.2	4.8

Natural gas exports to the United States were down 26% in value from $476 million in 1982 to $354 million in 1983. On the other hand, Mexico had a significant favorable balance in its trade of petroleum products. Lower domestic consumption resulting from the economic recession made it possible to expand exports of petroleum products by 143% to a value of $866 million. The exports consisted mostly of diesel oil, 33%; gasoline, 25%; and fuel oil, 25%.

After hydrocarbons and tourism, the mining-metallurgical sector became the third most important earner of foreign exchange. During the year, the Government sought to alleviate its foreign debt crisis by encouraging exports of manufactures and nonfuel mineral commodities. As a result of expanded output and higher prices, exports of refined silver (the most important export item after crude oil) increased from $296 million in 1982 to $395 million in 1983. Since most silver in Mexico is associated with lead and zinc, production of these items also rose, which created surpluses for export. Although exports of lead and zinc concentrates fell, exports of refined lead increased by 30% and refined zinc by 470% in value, reflecting the new zinc refinery capacity in San Luis Potosí. The export value of processed copper was up more than 100%, and of gypsum, up almost 300%. Analysis of Mexico's large diversity of mineral exports reveals that the five leading export commodities were, in terms of value, silver, 39% of the total; copper, 17%; sulfur, 10%; zinc, 8%; and salt, 4%. Combined, they accounted for 81% of the total value of nonfuel mineral exports. As for mineral imports, the most important in terms of value were aluminum, copper, phosphate rock, asbestos, nickel, and barite. The economic recession caused a sharp reduction in imports of practically all mineral commodities except tin. Drastic reductions occurred in bauxite, down 40%; other nonferrous metals, down 52%; barite, down 61%; and phosphate, down 69%. Imports of refined copper and nickel also experienced sharp drops.

Thus, as a result of expanded exports to more than $1 billion and curtailed imports to $400 million, Mexico had a very favorable mineral trade balance. According to Consejo de Recursos Minerales' (CRM) report for 1982,[3] the United States, with 44%, had the largest share of Mexico's nonfuel mineral export market, followed by Japan, 21%, and the Federal Republic of Germany, 7%. As for suppliers of mineral imports, the United States accounted for 65% of the total, followed by Canada, 9%, and Morocco, 6%.

On July 17, 1983, Mexico and Venezuela signed an agreement to renew the San José oil supply agreement for a fourth year beginning August 4. Under the agreement, Belize was added for a total of 10 countries in the Caribbean Basin. Each country was to supply 80,000 barrels per day for a total of 160,000 barrels per day for the 10 participating countries. For 1983, actual shipments to nine countries amounted to only 91,000 barrels per day, one-half of which came from Mexico.

Table 2.—Mexico: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	78	267	23	West Germany 47; Belgium-Luxembourg 17.
Antimony:				
Ore and concentrate	830	2,254	2,123	United Kingdom 29.
Metal including alloys, all forms	78	58	3	Brazil 55.
Arsenic: Oxides and acids	3,495	2,466	2,466	
Bismuth: Metal including alloys, all forms	^{r}669	^{r}627	341	Belgium-Luxembourg 175.
Cadmium: Metal including alloys, all forms	335	354	163	Brazil 103; Netherlands 21.
Copper:				
Ore and concentrate	^{r}161,100	^{r}161,461	47,054	West Germany 41,476; Japan 26,848.
Metal including alloys:				
Scrap	34,698	59,071	59,071	
Unwrought	6,949	12,073	7,638	Australia 2,174; Japan 1,255.
Semimanufactures	416	952	944	Costa Rica 4; Ecuador 2.
Iron and steel:				
Iron ore and concentrate	2,079	160	NA	NA.
Metal:				
Scrap	1,970	19,741	19,570	France 153; Canada 18.
Pig iron, cast iron, related materials	61	47	42	Guatemala 3; Venezuela 2.
Ferroalloys	25,688	17,351	NA	NA.
Semimanufactures:				
Bars, rods, angles, shapes, sections	4,593	178,283	NA	NA.
Universals, plates, sheets	663	15,263	NA	NA.
Rails and accessories	23	46	NA	NA.
Tubes, pipes, fittings	31,187	45,415	NA	NA.
Castings and forgings, rough	8,558	9,775	9,167	Federal Republic of Germany 73; Japan 34.
Lead:				
Ore and concentrate	^{r}6,497	^{r}(2)	(2)	
Oxides	24,373	19,018	11,202	Colombia 2,174; Dominican Republic 748.
Metal including alloys:				
Unwrought	57,177	61,883	19,522	Italy 10,948; Japan 9,217.
Unspecified	343	197	41	United Kingdom 79; West Germany 67.

See footnotes at end of table.

Table 2.—Mexico: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Manganese:				
Ore and concentrate	^{r}176,294	^{r}148,349	1,328	Japan 62,752; Venezuela 44,433; France 22,000.
Oxides	30,423	21,542	473	Brazil 7,087; Colombia 4,707; Japan 2,150.
Mercury 76-pound flasks	^{r}6,933	^{r}5,468	251	Brazil 1,800; Argentina 1,688; Japan 1,101.
Molybdenum:				
Ore and concentrate	--	2,504	291	West Germany 1,366; United Kingdom 312; Belgium-Luxembourg 240.
Oxides and hydroxides	422	509	379	Japan 76; West Germany 52.
Silver: Metal including alloys, unwrought and partly wrought thousand troy ounces	38,774	38,291	19,714	Japan 5,916; United Kingdom 3,729.
Tungsten: Ore and concentrate	^{r}401	^{r}606	606	
Zinc:				
Ore and concentrate	^{r}154,460	^{r}157,245	29,263	Belgium-Luxembourg 97,311; Brazil 11,249.
Oxides	13,492	13,137	NA	NA.
Blue powder	1,765	2,095	1,716	Venezuela 193; Argentina 100.
Metal including alloys:				
Scrap	36	7	7	
Unwrought	22,155	14,553	8,333	Guatemala 2,090; Brazil 1,620.
Semimanufactures	6,757	22,966	14,536	Brazil 2,172; Guatemala 1,071.
NONMETALS				
Barite and witherite	123,183	123,672	122,070	Cuba 250.
Clays, crude:				
Bentonite	22	820	20	Costa Rica 800.
Kaolin	1,428	29	(2)	Guatemala 26; Chile 2.
Unspecified	381	139	25	Colombia 54; Guatemala 20.
Diatomite and other infusorial earth	1,549	1,660	77	Brazil 525; Argentina 507; Peru 290.
Feldspar, fluorspar, related materials	^{r}680,580	^{r}350,907	190,112	Canada 84,876; Netherlands 46,677.
Graphite, natural	34,096	28,428	28,079	Spain 162.
Gypsum and plaster thousand tons	1,563	1,329	1,111	Canada 47; Switzerland 40.
Phosphates, crude	8,000	34,428	21,965	Japan 12,463.
Precious and semiprecious stones other than diamond: Natural	26	(2)	(2)	France (2).
Salt and brine thousand tons	^{r}5,020	4,688	2,249	Japan 2,116.
Sodium compounds, n.e.s.: Sulfate, manufactured	157,864	178,734	42,927	Brazil 76,881; Japan 15,103; Venezuela 14,450.
Stone, sand and gravel:				
Dimension stone: Crude and partly worked	2,434	2,838	2,838	
Dolomite, chiefly refractory-grade	410	330	--	Guatemala 180; El Salvador 120.
Limestone other than dimension	2,697	1,769	1,768	United Kingdom (2).
Quartz and quartzite	23	12	6	El Salvador 5.
Sand and gravel	99	5,044	5,044	
Strontium minerals: Celestite	41,250	26,161	26,161	
Sulfur: Elemental: Crude including native and byproduct thousand tons	1,200	^{r}890	576	United Kingdom 101; Argentina 35.
Talc, steatite, soapstone, pyrophyllite	10	(2)	NA	West Germany (2).
Vermiculite	636	39	39	
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	524	22,546	22,239	Guatemala 186.
Carbon: Carbon black	812	915	573	Colombia 78; Cuba 43.
Coal: All grades including briquets	309	14	NA	NA.
Coke and semicoke	111	(2)	--	All to Dominican Republic.
Petroleum:				
Crude thousand 42-gallon barrels	400,777	544,614	251,105	Spain 61,286; Japan 36,581; Brazil 20,952.
Refinery products:				
Liquefied petroleum gas do	931	431	NA	NA.
Gasoline, motor do	356	57	56	NA.
Kerosine and jet fuel do	146	173	8	NA.
Distillate fuel oil do	3,124	947	477	Brazil 16.
Lubricants do	13	--		
Residual fuel oil do	19,073	12,981	11,854	Brazil 1,042; Japan 2.

^{r}Revised. NA Not available.

[1] Table prepared by John G. Panulas.

[2] Less than 1/2 unit.

Table 3.—Mexico: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	[r]63,945	[r]43,259	30,236	Guyana 6,085; Suriname 3,050.
Oxides and hydroxides	104,796	90,012	89,765	Italy 181.
Metal including alloys, all forms	50	16	10	Canada 4.
Arsenic: Metal including alloys, all forms	1,609	509	509	
Chromium: Ore and concentrate	47,612	43,245	26,801	Cuba 8,260; Belgium-Luxembourg 7,885.
Cobalt: Metal including alloys, all forms	87	90	53	Belgium-Luxembourg 24; Canada 6.
Copper: Metal including alloys, all forms	102,019	23,690	13,099	Chile 6,510; United Kingdom 2,152.
Iron and steel:				
Iron ore and concentrate	[r]446,627	[r]1,076	850	Brazil 224.
Metal:				
Scrap	213,560	87,011	71,650	West Germany 14,483.
Pig iron, cast iron, related materials	153,708	44,433	24,641	Brazil 16,554.
Ferroalloys	28,293	4,800	NA	NA.
Steel, primary forms	403,284	89,299	65,681	Italy 10,201; Switzerland 7,963.
Semimanufactures:				
Bars, rods, angles, shapes, sections	31,427	13,272	10,577	Spain 823; Japan 607.
Universals, plates, sheets	650,180	368,620	NA	NA.
Rails and accessories	67,252	28,930	28,930	
Wire	127,096	25,958	NA	NA.
Tubes, pipes, fittings	1,461	628	NA	NA.
Lead: Metal including alloys:				
Scrap	909	902	902	
Unwrought	141	112	111	West Germany (2).
Unspecified	32	78	78	
Magnesium: Metal including alloys, all forms	2,833	2,685	2,405	Norway 255; Canada 16.
Manganese:				
Ore and concentrate	64,238	59,320	29,320	Congo 15,000; Panama 15,000.
Oxides	20	25	25	
Molybdenum:				
Ore and concentrate	927	240	240	
Metal including alloys:				
Unwrought	189	43	43	
Unspecified	15	9	7	United Kingdom 1.
Nickel:				
Matte and speiss	4,049	4,312	2,843	France 621; United Kingdom 311.
Oxides and hydroxides	511	267	242	France 25.
Metal including alloys, semimanufactures	192	112	59	Switzerland 17; France 12; Canada 10.
Selenium, elemental	31	21	20	West Germany (2).
Silicon, high-purity	1,390	1,381	1,225	Brazil 141; France 13.
Tin:				
Ore and concentrate	[r]2,747	[r]973	621	Malaysia 150; Singapore 114.
Metal including alloys:				
Scrap	211	405	405	
Unwrought	451	454	451	United Kingdom 3.
Titanium:				
Ore and concentrate	50,820	41,994	12,401	Australia 15,363; Austria 14,229.
Oxides	916	926	115	West Germany 510; Japan 108; Belgium-Luxembourg 98.
Tungsten: Metal including alloys, all forms	113	50	46	West Germany 3.
Vanadium: Oxides and hydroxides	309	145	135	West Germany 10.
Zinc:				
Oxides	365	66	51	Belgium-Luxembourg 10; West Germany 5.
Blue powder	133	207	206	West Germany (2).
Metal including alloys:				
Scrap	10	14	14	
Unwrought	18	1	1	
NONMETALS				
Abrasives, n.e.s.: Natural: Corundum, emery, pumice, etc	1,441	1,380	1,288	Netherlands 50; West Germany 37.
Asbestos, crude	[r]75,263	[r]55,732	15,593	Canada 30,587; West Germany 3,935.
Barite and witherite	132,923	190,602	64,695	India 68,993; China 43,972.
Boron materials: Crude natural borates	598	169	169	
Clays, crude:				
Bentonite	9,890	5,459	5,364	Switzerland 3.
Kaolin	[r]80,289	[r]67,233	66,881	United Kingdom 163.
Unspecified	194,214	131,014	129,427	West Germany 707.

See footnotes at end of table.

Table 3.—Mexico: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Cryolite and chiolite	177	98	(2)	Denmark 35; West Germany 31.
Diamond: Gem, not set or strung value, thousands	$23	$69	$62	Belgium-Luxembourg $7.
Diatomite and other infusorial earth	623	216	212	Spain 2; West Germany 1.
Feldspar, fluorspar, related materials	10	2,015	2,015	
Fertilizer materials: Manufactured, potassic	168,352	117,981	50,321	Spain 30,400; Canada 21,079.
Graphite, natural	1,013	363	277	Canada 54; West Germany 29.
Gypsum and plaster	44,419	22,403	22,339	El Salvador 20; France 20; United Kingdom 15.
Magnesite	224	89	69	Netherlands 20.
Mica:				
Crude including splittings and waste	152	128	110	West Germany 8; United Kingdom 6.
Worked including agglomerated splittings	94	45	36	Spain 5; Belgium-Luxembourg 1.
Phosphates, crude thousand tons	1,181	1,036	351	Morocco 665.
Precious and semiprecious stones other than diamond: Natural	37	2	2	
Salt and brine	2,263	1,106	1,104	West Germany 1.
Sodium compounds, n.e.s.: Carbonate, manufactured	141,031	116,583	116,582	West Germany (2).
Stone, sand and gravel:				
Dimension stone, crude and partly worked	5,878	5,284	190	Italy 2,852; Guatemala 2,242.
Dolomite, chiefly refractory-grade	3,328	2,156	2,000	Canada 155.
Quartz and quartzite	3,641	4,577	4,254	Sweden 253; Belgium-Luxembourg 32.
Sand and gravel	85,988	35,163	3,935	Guatemala 31,228.
Sulfur: Elemental:				
Crude including native and byproduct	20,799	542	542	
Colloidal, precipitated, sublimed	378	364	362	West Germany 2.
Talc, steatite, soapstone, pyrophyllite	[r]163,970	[r]93,534	90,699	Italy 1,386.
Vermiculite	2,497	679	679	
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	12,408	4,572	4,572	
Carbon:				
Carbon black	509	374	374	
Gas carbon	779	133	108	Japan 15.
Coal: All grades including briquets	675,301	644,751	420,452	Canada 167,130; Colombia 54,651.
Coke and semicoke	157,228	91,234	91,234	
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	1,910	1,315	NA	NA.
Gasoline:				
Aviation do	51	45	NA	NA.
Motor do	410	--		
Mineral jelly and wax do	17	19	NA	NA.
Kerosine and jet fuel do	221	439	NA	NA.
Distillate fuel oil do	105	--		
Lubricants do	948	1,147	NA	NA.

[r] Revised. NA Not available.

[1] Table prepared by John G. Panulas.

[2] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—According to data compiled by El Instituto del Aluminio A.C. (INDAL), Mexico's apparent consumption of aluminum dropped sharply from 200,000 tons in 1981 to 82,200 tons in 1983. Since Mexico is not self-sufficient in aluminum, imports fell drastically from 141,700 tons to 23,700 tons in the same years, respectively. This retrenchment was a consequence of the country's austerity program and the economic recession.[4] INDAL is an association of 43 Mexican companies that are involved with aluminum from ingot form to finished products and that operate 41 plants.

Antimony.—Mexico ranked among the major world producers of antimony, and in the Latin American region ranked second in importance after Bolivia. Mine output of antimony in Mexico has been in a long-term downward trend since World War II when output peaked at 13,700 tons (1943). Output increased sharply by 61% from the depressed level of 1982, especially in the form of antimonial lead, refined antimony, and antimony shipped as concentrate. Some of the concentrate was smelted at a refinery in San Luis Potosí. Practically all of the ore and concentrate exported went to the United States.

Copper.—Mine output of copper declined to 196,000 tons, almost 15% below that of 1982 after 4 years of remarkable growth when copper production expanded by 175% from the level of 83,000 tons mined in 1978. In response to lower prices and less demand for copper, production was curtailed at the major mines, La Caridad and Cananea, both in Sonora State. A 42-day strike at Cananea, which ended in October, also contributed to the decreased production. La Caridad Mine, Mexico's largest copper producer, was operating at the 60,000- to 65,000-ton-per-day range compared with the design capacity of 72,000 tons of ore per day. MEDIMSA, Mexico's third largest copper producer, experienced a 14% drop in copper output to 14,200 tons. Copper was recovered at several of MEDIMSA's mining units, San Martín, Santa Bárbara, and Tecolote. The San Martín unit in Zacatecas was the most important copper source with 4,900 tons. Copper concentrate was processed at MEDIMSA's 42,000-ton-per-year smelter at San Luis Potosí where output of blister was 32,700 tons, a 10% increase over that of 1982. La Caridad's annual output of 140,000 tons, plus Cananea's 30,000 tons, accounted for 83% of Mexico's total copper output.

Mexicana de Cobre, operator of La Caridad, was completing the final phase of the $1 billion mine and metallurgical complex at Nacozari, Sonora State. The mixed equity company is owned 56% by private Mexican interests and 44% by the Government. MEDIMSA was the largest private shareholder with 15% of the equity. During the year, the company authorized expansion of the La Caridad Mine capacity from 72,000 to 90,000 tons per day, which was to be completed in early 1985. The investment program included construction of a $250 million smelter with a capacity of 180,000 tons of blister copper per year that was rescheduled for startup in mid-1985. The copper refinery to be built by Mexicana de Cobre at the Port of Guaymas was postponed because of Mexico's difficult foreign exchange situation and foreign debt problem.

Minera de Cananea was implementing its mine, mill, and smelter expansion program at Cananea at a reduced level because of the deferment of the $450 million loan from the International Finance Corporation (IFC) of the World Bank Group. Although the IFC decided to postpone its financial participation in the project, the Export-Import Bank decided to go ahead with a $76 million credit package covering the sale of U.S. trucks and mining equipment valued at $117 million.

Before the startup of the La Caridad Mine, Cananea was Mexico's largest copper producer and had been in operation since 1899. Under Cananea's expansion plans, mine capacity is to be increased from 30,000 to 90,000 tons of ore per day, and the smelter is to be expanded from 70,000 to 125,000 tons of blister copper per year. In 1983, Cananea's blister output dropped to 27,000 tons compared with 53,000 tons in 1980. The smelter expansion, still to be initiated, was scheduled for partial operation by mid-1986. The mine and concentrator expansion was planned for completion by mid-1985. Parsons Engineering Co. and Bechtel Inc. have been contracted for various parts of the expansion program.

Cobre de México S.A., Mexico's only producer of refined copper, completed expansion of its capacity from 120,000 to 150,000 tons per year. Mexico's refined copper consumption peaked at 135,000 tons in 1981, falling to 88,000 tons in 1982 and decreased further to about 79,000 tons in 1983.

According to the latest available Government report[5] on mining, copper accounted for 12% of the total value of Mexico's mining-metallurgical output, excluding oil and gas, and 25% of the exports—exceeded only by exports of silver.

During the year, considerable concern was expressed in the U.S. Congress and in the Southwestern U.S. press about the lack of air pollution controls in the copper smelter projects of Cananea located near the Mexican-Arizona border. Cananea officials declared their intention to install modern emission control equipment and build a sulfuric acid plant as financing becomes available. It was agreed that the border pollution problem could best be discussed and solved within the framework of the new U.S.-Mexican agreement on the environment of the border area signed on August 14, 1983.

Gold.—Relative to the last two decades, gold production reached a peak. This upward trend was expected to continue in

1984 with the possible startup of the new Barqueno project and the expanded output of well-established copper-lead-zinc-silver operations where gold is a byproduct.

One of the most interesting developments in 1983 was the Mexican Government's new gold mining project, El Barqueno, in Ameca in the State of Jalisco located 100 kilometers due west of Guadalajara. CRM was conducting both exploration and heap-leaching experiments during the year. It was not possible to determine if commercial operations would begin during 1984. Early press reports indicate possible ore reserves of about 5 million tons with ore grades of 6 to 8 grams per ton. The reserves are concentrated into three major vein systems, which are large enough to be mined by open pit methods. The largest of these is reportedly 10 meters wide, 60 meters deep, and 3,000 meters long.

Important established private gold producers, PEÑOLES and MEDIMSA, reported lower gold output from their mines, contrary to the overall trend. PEÑOLES' mine output fell 7% to 42,000 ounces and that of MEDIMSA fell 17% to 10,700 ounces. PEÑOLES' refined gold production, using output from other mine operators, also fell to about 127,000 ounces, equal to 56% of national output.

Iron Ore.—The most salient event was the startup in June of the 382-kilometer, 14-inch slurry pipeline. The new line will transport iron ore concentrate from the La Perla Mine in Chihuahua State, operated by Altos Hornos de México S.A. (AHMSA), to the Hercules Mine, operated by Fundidora de Monterrey S.A. (FMSA). There it was to be blended for transport to the new 3-million-ton-per-year pellet plant at Monclova, Coahuila, which was also completed during the year. The slurry pipeline has a capacity of 4.5 million tons of concentrate per year and is one of the longest constructed to date. Both AHMSA and FMSA are subsidiary steel companies of the Government-owned firm, Siderúrgica Mexicana (SIDERMEX). The concentration plant of FMSA at the Hercules Mine was 70% completed and is expected to be ready by the end of 1984. La Perla's new concentrator was completed in 1982.

FMSA reported in 1983 that it plans to shut down its regular operations at the Cerro de Mercado Mine in Durango in 1984 but continue with periodic production of fine ore for pellet production. Cerro de Mercado's run-of-mine output in 1983 was 453,200 tons of iron ore. In Colima State, Las Encinas S.A. was increasing pelletizing capacity at Alzada from 1.6 to 1.8 million tons per year. Las Encinas shipped 1.5 million tons of pellets to direct-reduction plants at Puebla and Monterrey. In neighboring Michoacán State, pelletizing capacity at the Lázaro-Cárdenas steelworks was undergoing expansion from 1.8 to 4.8 million tons per year. Mexico's pellet production was 6.6 million tons in 1982, and installed pellet capacity was projected to expand to 14.7 million tons by 1984.[6]

According to the 1983 annual report of CAMIMEX, Mexico's run-of-mine iron ore output by mine is shown below:

Mine	Quantity (metric tons)
Peña Colorado	4,330,000
La Perla	3,339,600
Las Truchas	3,259,000
El Encino	2,040,000
Cerro de Mercado	800,000
Hercules	84,300
Other (estimated)	100,000
Total	13,952,900

Exploration for iron ore was centered mostly around the currently operating mines. During the year, an additional 647 million tons of measured reserves was added, which increased total reserves to 830 million tons. PEMEX completed an iron ore exploration program under contract with SIDERMEX that had been initiated in 1979. This program will be continued by the Instituto Mexicano del Petróleo.

Iron and Steel.—Because the economic recession reduced domestic demand, Mexico continued to seek overseas markets for its steel output. Further devaluation of the Mexican peso also made the country's steel products more competitive. It was estimated[7] that Mexico exported steel valued at $860 million, compared with the $67 million value in 1980, of which $560 million was marketed in the United States. At the same time, Mexico drastically reduced steel imports to $285 million compared with $3.1 billion in 1981. National production decreased only slightly because the Government decided to support production and employment through an aggressive exporting policy. Most of the exports were supplied by the three subsidiary companies of SIDERMEX.

In November, United States Steel Corp. accused Mexico of unfairly subsidizing steel exports and asked the U.S. Department of Commerce to impose a punitive tariff of 35% on seven Mexican steel products, ranging from galvanized sheet metal to heavy pipe. Later that month, five other U.S. steel companies also filed petitions backing United States Steel's position and additionally charging Mexico with illegal dumping of steel products. Mexican opinion indicated that it was counterproductive to impose countervailing duties on developing countries like Mexico with a foreign debt crisis.

Domestic demand for steel products decreased by 23% in 1983; apparent consumption was 4.8 million tons compared with 8.7 million tons in 1981. The SIDERMEX parastate companies (AHMSA, FMSA, and Siderúrgica Lázaro-Cárdenas Las Truchas S.A.) had a surplus of 568,000 tons, mainly nonflat steel products. Reduced local demand included tubular goods, which dropped from 1.4 million tons in 1981 to 822,000 tons in 1982. PEMEX's development plans called for consumption of tubular goods to grow from 282,600 tons in 1983 to 434,300 tons in 1984.

Lead and Zinc.—Most of Mexico's numerous silver mines produced lead and zinc as coproducts. The significant growth in lead and zinc mine output reflected the 7.5% increase in mined silver. The MEDIMSA mines continued as the leading lead-zinc producers, followed in importance by the mining units of the PEÑOLES Group. According to 1983 company reports, output for the major companies is shown below, in metric tons:

Company	Lead	Zinc
México, Desarrollo Industrial Minera S.A	54,160	145,620
Industrias Peñoles S.A. de C.V	52,480	49,320
Minera Real de Ángeles S.A. de C.V	27,800	21,900
Frisco S.A. de C.V	17,600	25,000
Other	32,220	24,460
Total	184,260	266,300

The decreased lead and zinc output by MEDIMSA and PEÑOLES was more than compensated for by the new output as byproducts of the Real de Ángeles silver mine operations.

MEDIMSA's new 113,000-ton-per-year electrolytic zinc refinery at San Luis Potosí had its first full year of operation. During the first part of the year, the plant experienced startup difficulties, but by September, the plant was operating at 70% to 75% capacity. Refined zinc production increased 110% to 76,740 tons from 36,400 tons in 1982. The plant's cadmium recovery circuit was started up and is in the process of bringing output up to market quality. Beginning in mid-1985, MEDIMSA's Charcas Unit will supply additional zinc concentrate with low iron content to the new refinery.

Manganese.—Production of manganese fell drastically by 27% below that of 1982 as a consequence of lower demand for steel at home and overseas. Cía. Minera Autlán S.A. de C.V., the leading Mexican producer of both manganese ore and manganese ferroalloys, announced successful pilot production of electrolytic manganese dioxide and was reportedly planning a commercial dioxide plant with an annual capacity of 6,600 tons. Autlán's shipments of oxide nodules from its mining and calcining operations totaled 354,000 tons, of which about 235,000 tons was for domestic consumption and about 119,000 tons was exported. In 1982, Japan replaced the United States as the most important market for Mexico's manganese concentrate. Brazil and Colombia were the leading markets for battery-grade ore. Total production of ferroalloys in 1983 rose to 215,700 tons, up almost 10% from that of 1982. This production comprised ferromanganese, 66%; silicomanganese, 21%; ferrosilicon, 12%; and special alloys, 1%, particularly ferrochrome and ferrosilicomagnesium. Future domestic demand for manganese ferroalloys was projected to reach 94,000 tons in 1984 and 102,000 tons in 1986.

Molybdenum.—Mexico made further progress in the dramatic revitalization of its molybdenum output. The 13% increase over that of 1982 in mine production was the result of the third full year of operation of the Cumobabi Mine in Sonora State and the first full year of operation of the molybdenum byproduct plant at the La Caridad copper mine. Cumobabi's output increased by 20% over that of 1982 to 1,200 tons, and La Caridad's output was estimated at 4,600 tons. By yearend, La Caridad was producing a high-quality 58% molybdenum concentrate. The Cumobabi Mine was operated by Minera Cumobabi S.A. de C.V., a subsidiary of Frisco. During the year, Cumobabi completed the installation of equipment and mill tests needed to produce high-purity molybdenum sulfide, which would increase the value added of the marketable product. The first sales of this improved product were expected in early 1984. Cumobabi, in 1983, increased its sales of molybdenum trioxide by 50% over that of 1982. Because of the surge in molybdenum output, Mexico became the fifth most important world producer, replacing China. In the Western Hemisphere, Mexico ranked after the United States, Chile, and Canada.

Silver.—Mexico regained its position as the leading world producer of silver. The 7.5% increase in mine output over that of 1982 resulted chiefly from the first full year of operation of the new open pit Real de Ángeles Mine in Zacatecas State and from expanded output by the traditional silver mining companies. Real de Ángeles mine output for the year was 3.7 million tons of ore. Silver content was almost 7.8 million troy ounces, and significant quantities of lead and zinc were obtained. Minera Real de Ángeles is owned by the state entity, Comisión de Fomento Minero, 33%; Frisco, 33%; and Placer Development Ltd. of Canada, 34%. Silver-lead and zinc concentrates were shipped to the Torreón metallurgical complex.

Although PEÑOLES' output dropped slightly, it continued as Mexico's major silver producer, accounting for 28% of the country's total. PEÑOLES' output from its own mines was almost 17 million troy ounces, while output from its refinery in Torreón, Coahuila, was 33.5 million troy ounces. During the year, PEÑOLES completed installation of new crushing plants at its Fresnillo and Naica Mines. The Fresnillo Mine in Zacatecas and the Naica Mine in Chihuahua were operated by Cía. Minera Fresnillo S.A. de C.V., a joint venture of PEÑOLES, 60%, and AMAX Inc., 40%. At Fresnillo, silver output has been increasing, while that of zinc has been decreasing as a result of exploitation of the silver-rich Santo Niño vein discovered a few years ago. AMAX reported that the Fresnillo-Zimapan operations produced 9 million ounces of silver, a 5.5% increase over that of 1982. At La Negra Mine in Guerétaro State, production was increased 15% by more efficient use of installed equipment. New equipment planned for 1984 will further increase the capacity by 11%.

Exploration work at La Encantada Mine at Piedras Negras, Coahuila State, was successful in establishing 1.5 million tons of proven reserves, grading 7.2 ounces of silver per ton with 3.5% lead, and 124,000 tons grading 36 ounces of silver per ton with 17.3% lead. Owing to lack of water in the semiarid environment, the concentration plant operated at less than full capacity. To compensate for this, high-grade ore with 39 ounces of silver per ton and 21% lead was shipped directly to the smelter. La Encantada is a joint venture of PEÑOLES, 60%, and Lacana Mining Corp. of Canada, 40%. Exploration was managed by Contratista Tormex S.A., a wholly owned subsidiary of Lacana, while PEÑOLES managed the mines. Lacana reported that La Encantada produced over 1.8 million ounces, while its 30%-owned Torres mining complex in Guanajuato produced 4.1 million ounces.

Mexico's second largest silver producer, MEDIMSA, increased mine output by 5.3% over that of 1982 to 13.1 million troy ounces, while its refinery output at Monterrey increased almost 19% over that of 1982 to 21.5 million troy ounces. Silver sales by MEDIMSA's operating companies accounted for 46% of the total. The completion of two new shafts in MEDIMSA's Santa Bárbara Unit permitted it to operate at the full capacity of 4,800 tons of ore per day as the largest underground mine in Mexico. Expansion work of the second stage at the San Martín Unit continued during the year to increase productive capacity from 2,400 to 6,800 tons of ore per day. At yearend, the new beneficiation plant was 80% completed and scheduled for startup in July 1984.

Mexico succeeded in refining 82% of its total mine output, while only 5% or 2.89 million troy ounces of silver was shipped in concentrates. Benefiting from increased output and higher world prices, Mexico's foreign exchange earnings from silver exports increased by 33% over those of 1982 to $395 million. Silver accounted for 39% of total nonfuel mineral exports. The average price of silver rebounded to $11.44 per ounce, substantially above the $7.95 average price in 1982. But at yearend, the price fell to $8.95 per ounce. Data available for 1982 from CRM show that the United States was the most important market for Mexican silver bullion, receiving 52%, followed by Japan, 16%; the United Kingdom, 10%; and the Federal Republic of Germany, 8%. During 1978-82, Mexico supplied 23% of U.S. silver imports, second in importance after Canada.

NONMETALS

Barite.—The Cobachi barite deposit, 80 kilometers east of Hermosillo, Sonora State, was under development by Minera Baucarit S.A. de C.V., owned 51% by Protexa S.A. and 49% by FMC Corp. of the United States. A contract for detailed engineering was awarded in late 1983. Construction was to begin in 1984 and startup in 1986. Annual output from the beneficiation facility will be 237,000 tons of concentrate. Reserves in the Cobachi deposit were estimated at 16.4 million tons, of which 3 million tons is proven, grading 75% barium sulfate. The

$14 million project will employ 109 persons.

As a result of steady operations of its La Minita Mine in Coalcomán, Michoacán, PEÑOLES' output of barite increased sharply from 23,000 tons in 1982 to 52,800 tons in 1983. La Minita's design capacity is 150,000 tons per year. The additional output from La Minita added to that of Barita de Sonora in Villa Pesqueira, also 150,000 tons per year, will meet all of PEMEX's needs and provide a surplus for export. PEMEX consumption was less than 400,000 tons.

Cement.—As a consequence of lower domestic demand caused by a slump in construction, a surplus of cement became available for export. Imports of Mexican hydraulic cement and clinker by the United States increased from 120,000 tons in 1982 to 750,000 tons with a c.i.f. value of $34 million. Following a petition by the U.S. cement industry and on the basis of a discovery of subsidy practices, the International Trade Administration of the U.S. Department of Commerce imposed a countervailing duty on cement imports from Mexico effective September 21, 1983, for 1 year.

Fluorspar.—The Instituto Mexicano de la Fluorita reported a modest increase over that of 1982 in fluorspar sales to 600,000 tons, while actual mine output decreased significantly. Sales, which have been severely depressed in recent years, were 261,000 tons for domestic markets and 339,000 tons for export. As a result of reduced export demand, especially by the United States, which is Mexico's major market, Mexico was surpassed by Mongolia as the world's leading fluorspar producer. Mongolia produced 16% of the world output, while Mexico accounted for 14%. Mexican exports accounted for about 17% of the total fluorspar entering world trade, which is estimated at 2 million tons. Mexico was the third most important trading country after Mongolia and China.

The United States imported 385,000 tons of acid-grade fluorspar valued at $41 million, of which 46% came from Mexico. Imports of metallurgical and ceramic grades amounted to 68,000 tons valued at $6 million, of which 64% came from Mexico. Hydrofluoric acid imports amounted to 92,000 tons valued at $83 million, of which 61% came from Mexico.

Eight major companies operating in the States of San Luis Potosí, Chihuahua, Coahuila, and Durango accounted for most of Mexico's production. Another major company, Cía. Minera Río Colorado S.A., in San Luis Potosí, closed for economic reasons. Significant quantities of fluorspar are produced by more than 100 small miners in Coahuila. Four hydrofluoric acid plants were operating in Mexico. The eight major companies had proven reserves of 37 million tons with an average grade of 62% CaF_2 and an installed capacity of 1,360,000 tons. The largest proven reserves, estimated at 14.5 million tons, were held by Mexico's leading producer, Cía. Minera Las Cuevas S.A. de C.V. Mexico has the fourth largest reserves after the U.S.S.R., China, and Mongolia.

Mexican fluorspar producers began the year by reducing the price of acid-grade and metallurgical-grade fluorspar by 29% and 23%, respectively. The average price fell from $123 per ton in 1982 to $87 per ton in 1983. The price reduction was the first since formation of the Instituto Mexicano de la Fluorita in 1974. To become more competitive, the members of this institute agreed to remove most restrictions and allow the price of fluorspar exported from Mexico to float, effective January 1, 1984. This policy, part of an effort by Mexican producers to recapture market shares lost during 1982 and 1983, will allow each producer to negotiate its own price. The Mexican price had become an important standard worldwide. Floating the Mexican price, therefore, was expected to result in lower average prices and less stability in world fluorspar markets.

Magnesium Compounds.—Although Mexico mined a modest amount of magnesite (magnesium carbonate) from natural sources, most of the magnesium compounds were produced at chemical plants in the form of magnesia (magnesium oxide). At Laguna del Rey, Coahuila, Química del Rey S.A., a PEÑOLES subsidiary, started up its plant that had been expanded from 40,000 to 100,000 tons per year of magnesia. Química del Mar S.A., another subsidiary of PEÑOLES, also completed expansion of its plant at Ciudad Madero, Tamaulipas, that makes magnesia from seawater. With these two expansions, Mexico became self-sufficient in magnesia and gained a surplus for export. PEÑOLES' two plants increased production by 15% over that of 1982 to 66,300 tons of magnesia.

Nitrogen.—Mexico is self-sufficient in the production of nitrogenous fertilizer with a surplus for export. Mexico has been increasing its capacity to produce ammonia from its abundant natural gas resources since 1962 when the first ammonia plant was installed by PEMEX in Salamanca, Guanajuato. By 1983, PEMEX had installed a capacity totaling 2.9 million tons of ammonia, or 2.4 million tons in nitrogen content. Six of the nine ammonia plants with 82% of national capacity have been installed by PEMEX in Cosoleacaque, Veracruz. Ammonia output decreased slightly from the record-high level of 1982. During 1979-82, Mexico supplied 21% of U.S. needs. Exports to the United States in 1983 totaled 430,000 tons, or 58% of Mexico's total export of 743,800 tons, which earned $112 million in foreign exchange. In 1981, PEMEX initiated production of liquid nitrogen at the level of 30,000 tons. Mexico was the largest producer and joined Trinidad and Tobago as the major exporter of ammonia in Latin America. The fertilizer complex under construction at Lázaro-Cárdenas Port will utilize 150,000 tons per year of ammonia for the ammonium nitrate plant. The two 445,000-ton-per-year ammonia plants planned for Salina Cruz and Camargo have been indefinitely postponed.

Phosphate Rock.—Domestic demand for inorganic fertilizer was depressed. There was, therefore, little change in production by state-owned Roca Fosfórica Mexicana S.A. de C.V. (ROFOMEX), which supplies primarily the inputs of Fertilizantes Mexicanas S.A. ROFOMEX reportedly has indefinitely postponed a $60 million project to build a concentrator in Santo Domingo, Baja California. This plant was to have a capacity of 1.5 million tons per year of phosphate rock concentrate.

Sodium Compounds.—Mexico was the major producer of sodium carbonate and sodium sulfate in Latin America. In the Western Hemisphere, Mexico is the only source of natural sodium carbonate (soda ash), other than the dry lake brines of California and the underground trona deposits of Green River, Wyoming. Sosa Texcoco S.A. was the only Mexican producer of natural soda ash from subsurface brine deposits at Ecatepec de Morelos at the edge of ancient Lake Texcoco, 20 kilometers from Mexico City. Texcoco reserves are estimated at 100 million tons. Texcoco was established in 1948 with an initial capacity of 30,000 tons per year. Since that time, the plant has been expanded in stages to the present capacity of about 200,000 tons per year. Future expansion of the well field will be affected by local housing pressures and possible expansion of the nearby international airport.

Synthetic soda ash was produced by Industria del Alcalí S.A. at its plant in Monterrey, Nuevo León, with a capacity of 200,000 tons per year. Mexico's apparent consumption of natural and synthetic soda ash was 532,000 tons, of which 397,000 was produced domestically and 135,000 tons was imported. Industria del Alcalí supplied 218,000 tons, or 41% of total consumption, while Texcoco supplied 179,000 tons of natural soda ash. Since 1948, when demand was 60,000 tons, Mexican production and consumption of soda ash have grown dramatically to meet the needs of the country's expanding glass, paper, soap, and textile industries. Industria del Alcalí was also the only producer of sodium bicarbonate, with an annual capacity of 34,000 tons. In 1983, 9,600 tons of bicarbonate was imported by the United States. The company is owned by Vitro S.A., which produces over 80% of the flat and container glass in Mexico.

Salt.—Mexico continued as the world's leading exporter of salt. The country's major salt producer and exporter, Exportadora de Sal S.A. (ESSA), exported 2.7 million tons to Japan, the chief market, and increased exports to the United States by 24% to 1.5 million tons. ESSA's production from the world's largest solar salt facilities at Guerrero Negro on the west coast of Baja California was hampered by heavy rains in this arid region, but overseas sales were maintained from inventories. Mexico earned almost $42 million from salt exports. These sales ranked second in importance after sulfur among the nonmetallics. During 1979-82, Mexico accounted for 28% of U.S. salt imports.

Sulfur.—Within the Latin American region, Mexico was the leading producer and exporter of elemental sulfur. Although sulfur output dropped 11%, sulfur exports rebounded from the depressed level of 1982, and accordingly, earnings increased 45% to $107 million. Sulfur continued as Mexico's most important nonmetallic mineral export, accounting for 11% of total mineral exports excluding mineral fuels. Mexico had some success in diversifying its exports away from the dominant U.S. market. The share of exports to the United States dropped from 87% of the total in 1980 to 65% in 1982. The United States imported 604,000 tons with a value of $67 million. During 1979-82, Mexico supplied 40% of U.S. sulfur imports.

MINERAL FUELS

Coal.—Production of run-of-mine coal reached almost 9 million tons, a historic high. The 18% increase over that of 1982 is attributed to the Government's new impetus given to steam coal production, which also increased to a record-high level. Steam coal output expanded to 1.8 million tons. Practically all of Mexico's coal output came from Coahuila State in the northeast. Exploration for coal in the northeast was under the control of the Comisión Federal de Electricidad (CFE), which has set up a special department, Estudios Carboníferos del Noroeste, for this purpose, under the National Coal Program. CFE also continued coal studies in the Triassic region of Colombia-Nuevo Laredo, as well as the subbituminous coal of the Ojinaga Basin in Chihuahua, which has a geology similar to that of Coahuila. Proven coal reserves in the Sabinas and Rio Escondido Basins in Coahuila are estimated at 2.2 billion tons, while total coal resources in Mexico are estimated at 4.9 billion tons.

Minera Carbonífera Río Escondido S.A. (MICARE), a mixed company with the majority of shares held by the Government, was the largest producer of steam coal. MICARE supplied increased amounts of steam coal from open pit and underground mines in Coahuila to the nearby Río Escondido electric generating complex at Piedras Negras, Coahuila. This complex was scheduled to complete installation of the second 300-megawatt generating unit in 1983. The other two units to complete the 1,200-megawatt José López Portillo complex were delayed because of budgetary reasons.

Mexico and Colombia were involved in negotiations concerning the shipment of 1.5 million tons per year of high-quality coking coal. The coal would be shipped from Colombia's Pacific ports to the SIDERMEX steel complex of Lázaro-Cárdenas that has experienced delays in coal shipments by railroad from Mexico's northeast coalfields. Previously, SIDERMEX imported coking coal from the United States and Canada, but this was curtailed after the 1982 foreign debt crisis. Mexico has had a significant trade surplus with Colombia, which in 1983 was $59 million. The proposed coal shipment would be in effect a barter arrangement covered by Mexico's surplus trade position.

MEDIMSA reported on the startup of a new open pit mine for metallurgical coal. However, company output dropped 11% to 803,330 tons because of lower domestic steel demand. In addition, MEDIMSA continued development of a new underground mine, Pasta de Conchos, in San Juan de Sabinas, Coahuila, to be operated under a subsidiary, Carbonífera de Nueva Rosita S.A. Capacity will be 480,000 tons per year, to be available in early 1985.

Geothermal Energy.—The Government was engaged in exploiting its geothermal resources as a viable energy alternative. Geothermal fields have been discovered in eight States giving a geothermal potential of about 12,000 megawatts. The most promising reserves have been discovered in three areas: Cerro Prieto, Baja California; Los Azufres, Michoacán; and Los Humeros, Puebla. Electrical generating capacity has already been installed at Cerro Prieto in the Mexicali Valley totaling 180 megawatts and at Los Azufres, 25 megawatts. The first unit of 37.5 megawatts was installed at Cerro Prieto in 1973. Two new units of 230 megawatts each were scheduled for startup in 1984-85. Under its short-term development plan, the Government proposes to add 740 megawatts to installed capacity in the three main fields mentioned above. Geothermal energy currently accounts for only 1% of Mexico's electric generating capacity. By 1988, this share was expected to increase to 2.6%.

Natural Gas.—Production of natural gas was down 4.5% from the record-high level of 1982. Only 21% of total output was unassociated with crude oil production. Of the total of 48 hydrocarbon fields under production and development by PEMEX, 18 fields were devoted to gas. There was a sharp increase in condensate in the gas operations from 654,000 barrels to 8.3 million barrels in 1983 because of newly installed separation equipment.

Flared gas was 11% of total output compared with 17% flared in 1981. PEMEX was expanding its gas pipeline system to meet increasing domestic industrial needs. During the year, the 16-inch gas pipeline from Querétaro at the main trunkline to San Luis Potosí, an important mining and metallurgical center, was started. Also the 48-inch extension of the main trunkline from Salamanca, Guanajuato, to Guadalajara, Jalisco, began operation. An important 24-inch gas pipeline was under construction between Salamanca on the main line to Lázaro-Cárdenas to supply gas for the direct-reduction units of the SIDERMEX steel complex. At yearend, PEMEX had 12,370 kilometers of gas pipelines in operation in Mexico. Mexico's policy was to export only surplus amounts of available gas. Because of lower demand in the U.S. market, PEMEX's deliveries of natural gas for export decreased 20% below 1982 levels to 79.4 billion cubic feet valued at $354 million. PEMEX's gas sales in Mexico accounted for 9% of its total product sales, while gas sales abroad were 2.2% of the total. In April, the consortium of U.S. gas importing companies notified PEMEX that it would reduce gas imports for the rest of the year from 300 million cubic feet per day to the contract minimum of 180 million cubic feet per day. Effective May 1, PEMEX reduced gas prices from $4.94 to $4.40 per million British thermal units. This decrease followed the Canadian decision to adjust its gas export price.[8]

Petroleum.—After 6 years of impressive growth, output of crude oil by PEMEX decreased for the first time, by 3%, to a daily rate of 2.67 million barrels. For the year, total production of liquid hydrocarbons including the oil equivalent of natural gas was 1.34 billion barrels. The most important producing zone was offshore in the Bay of Campeche, which provided 63% of total output, followed by the Southeastern Zone, 28%, and the Southern, Central, and Northern Zones, 9%. Of the total crude oil produced from 30 well fields, 20%, or 508,000 barrels per day, came from wells using water injection to maintain pressure and increase recovery of oil. In addition to oil production, PEMEX was responsible for oil processing and distribution. For this purpose, PEMEX operated a network of oil pipelines to nine refinery centers and processing plants totaling 4,370 kilometers. The volume transported during the year was 1.05 million barrels per day. Only 23,600 barrels per day was transported by coastal shipping.

Contrary to the production trend, exports of crude oil increased 3% over that of 1982 to a daily rate of 1.537 million barrels, which approximated the limit of 1.5 million barrels per day set by PEMEX for 1983 to maintain world price stability. PEMEX exported crude oil to 23 countries, the 5 most important of which were the United States, 53.6%; Spain, 10.5%; Japan, 7.8%; the United Kingdom, 5.6%; and France, 5.4%. These markets accounted for almost 83% of the total.

Table 4.—Mexico: Petroleum and natural gas production

Zone and district	Natural gas (million cubic feet)		Crude oil[1] (thousand 42-gallon barrels)	
	1982	1983	1982	1983
Marine Zone: Bay of Campeche	313,588	328,999	590,353	610,947
Southeastern Zone:				
Comalcalco District:				
Mesozoic[2]	772,593	735,279	304,533	268,228
Tertiary	5,912	5,217	6,704	5,047
Ciudad Pemex District	155,629	120,551	7	5
Total	934,134	861,047	311,244	[3]273,279
Central Zone:				
Poza Rica	51,309	41,289	42,287	32,856
Cuenca Papaloapan	22,732	23,134	4,279	3,688
Nueva Faja de Oro	11,359	15,948	--	--
Total	85,400	80,371	46,566	36,544
Southern Zone:				
Aqua Dulce District	20,178	19,942	17,536	17,782
El Plan District	20,496	19,489	16,261	15,374
Nanchital District	1,593	1,427	1,526	1,578
Total	42,267	40,858	[3]35,324	34,734
Northern Zone:				
Northern District	19,586	15,231	11,754	10,054
Southern District	8,600	9,418	7,039	7,145
Northeastern Frontier District	146,346	143,636	150	219
Total	174,532	168,285	18,943	17,418
Grand total	1,549,921	1,479,560	1,002,430	972,922

[1] Does not include condensate.
[2] Referred to as Cretaceous up to 1981.
[3] Data do not add to total shown because of independent rounding.

Source: Petróleos Mexicanos. Memoria de Labores, 1982 and 1983.

Mexico is the United States' most important source of oil imports and has become increasingly important to the United States. Mexico provided 23% of U.S. oil import requirements followed by the United Kingdom, Saudi Arabia, Nigeria, and Canada. Mexico's declared policy is not to allocate more than 50% of crude oil exports to any country. The limit was exceeded in 1983 because of shipments to the U.S. Strategic Petroleum Reserve under the 1-year special contract.

Crude oil exports were composed of 44% light Isthmus and 56% heavy Maya, which increased from the 54% share in 1982 because of heavy demand. Official export prices were changed during the year in response to world markets. As of February 1, a barrel of Isthmus crude was priced at $29, a $3.50 decrease from March 1, 1982. The price of Maya crude was changed three times, first lowered to $23 per barrel, subsequently increased by $1.00, and finally increased to $25 per barrel in October. PEMEX's total overseas sales were divided as follows: crude oil, 91.7%; petroleum products, 5.4%; natural gas, 2.2%; and petrochemicals, 0.7%.

PEMEX continued its aggressive program of exploration. The company assigned 78 exploration teams that completed 65 exploratory wells, of which 17 were producers, a success rate of 36%. Of the 17 fields discovered, 11 were oil, 5 were wet gas, and 1 was dry gas. The discovery of producing structures in the Chiapas-Tabasco Mesozoic, when added to others, enabled PEMEX to compensate for the hydrocarbons extracted during the year. Proven reserves of hydrocarbons as of December 31, 1983, increased to 72.5 billion barrels. On the basis of producing at a rate of 1.34 billion barrels of hydrocarbon produced in 1983, Mexico's present reserves would have a productive life of more than 50 years. Mexico ranked fifth in world reserves after Saudi Arabia, Iran, Kuwait, and the U.S.S.R.

At yearend, the U.S. Department of Energy issued a study on Mexico's recoverable crude oil resources as part of its program to assess the future supply capabilities of various oil-exporting countries, and the potential rate at which crude oil might be produced and enter into world markets.[9] This study estimates that Mexico's total recoverable crude oil resources amount to 115 billion barrels including known oil resources and undiscovered oil resources. With Mexico's total known ultimately recoverable reserves of 39 billion barrels, and assuming Mexico's cumulative crude oil production of about 9 billion barrels since oil was first discovered at Ebano in 1901, the remaining recoverable oil amounts to 30 billion barrels.

PEMEX reported that its accumulated production of hydrocarbons, including condensate and the oil equivalent of dry gas, for 1901-83 inclusive was 15.3 billion barrels.[10]

At midyear, oil ministers of Mexico, Venezuela, Ecuador, and Trinidad and Tobago met in Caracas for an exchange of information to strengthen the group's world marketing position. Mexico reiterated its position that it would not join the Organization of Petroleum Exporting Countries.

Uranium and Nuclear Energy.—Construction of Mexico's first 1,300-megawatt nuclear powerplant, Laguna Verde I in Veracruz State, was nearing completion. Uranio Mexicano S.A., the state uranium exploration company, was struck by its union in late May and appears to have suspended its research and exploration activities.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Mexican pesos (Mex$) to U.S. dollars at the average rate for 1983 of Mex$120=US$1.00. The free market rate at yearend was Mex$161=US$1.00. A dual exchange rate was maintained throughout 1983. The official controlled rate began the year at 96 pesos and ended at 144 pesos per dollar.

[3] Consejo de Recursos Minerales. Anuario Estadístico de la Minería Mexicana—1982. México, D.F., pp. 36, 50.

[4] El Mercado de Valores (Mexico City). No. 16, Apr. 16, 1984.

[5] Page 26 of work cited in footnote 3.

[6] Instituto Latinoameria del Fierro y el Acero (ILAFA). Siderúrgia Latinoamericano. Oct. 1983, p. 27.

[7] ———. Siderúrgica Latinoamericano. No. 266, Apr. 1984, p. 23.

[8] Petróleos Mexicanos (Mexico City). Annual Report, Memoria de Labores—1983. P. 16.

[9] U.S. Department of Energy, Energy Information Administration. The Petroleum Resources of Mexico. DOE/EIA-0423, Oct. 1983, p. 107.

[10] Petróleos Mexicanos (Mexico City). Anuario Estadístico—1983.

Table 5.—Mexico: Salient crude oil statistics[1]

	1979	1980	1981	1982	1983
Production thousand 42-gallon barrels	533,329	708,454	843,933	1,002,430	972,922
Exports:					
Quantity do	194,488	302,129	400,778	544,617	561,005
Value millions	$3,811	$9,449	$13,305	$15,623	$14,821
Share of total Mexican exports percent	43	62	69	74	69
To the United States:[2]					
Total thousand 42-gallon barrels	162,740	194,172	177,510	264,988	279,703
Share of total U.S. imports percent	7	10	10	19	23

[1] Based on annual reports of Petróleos Mexicanos (Memoria de Labores).
[2] Based on U.S. Department of Commerce import data.

Table 6.—Mexico: Proven hydrocarbon reserves

(Million 42-gallon barrels unless otherwise specified)

Zone	Dry natural gas (billion cubic feet)	Liquid hydrocarbons				
		Crude oil	Condensate	Dry natural gas liquid equivalent	Total 1983	Total 1982
1982 total	75,352	48,084	8,915	15,010	XX	[1]72,008
1983:						
Marine (Bay of Campeche)	12,241	28,734	3,285	2,448	34,467	34,044
Chicontepec	26,702	10,920	1,321	5,340	17,581	17,597
Southeastern	24,720	7,672	2,062	4,950	14,684	13,758
Northern	8,577	400	258	1,715	2,373	2,977
Central	3,566	1,294	187	713	2,194	2,362
Southern	1,192	891	72	238	1,201	1,271
Total	76,998	49,911	7,185	15,404	72,500	XX

XX Not applicable.
[1] Data do not add to total shown because of independent rounding.

Source: Petróleos Mexicanos. Memoria de Labores, 1982 and 1983.

The Mineral Industry of Morocco

By George A. Morgan[1]

The phosphate sector, which dominated the Moroccan mining industry, continued to suffer from both low prices and low demand for phosphate rock. A large stockpile of phosphate also existed. Increased production capacity for derivative fertilizer products resulted in increased sulfur imports valued at $132 million.[2] Phosphate rock exports were valued at $459 million, and phosphate derivatives, at $421 million. Activity continued strong in the copper, lead, silver, and nonmetallic mineral sectors.

Emphasis was placed on materials with high value of return. The Department of Mines and the Bureau de Recherches et de Participations Minières (BRPM) conducted extensive exploration and development studies for precious metals. Gold output from a small gold, silver, and copper deposit alone was valued at about $4 million. Promising silver deposits, some in ancient mining areas, were being explored for further reserves, and the existing silver operation at Imiter was under expansion.

Plans continued for further downstream processing of metal concentrates in Morocco. The lead smelter and refinery at Oued el Heimer was under study for expansion, and a copper smelter and refining complex was planned at Agadir to handle both domestic and foreign copper concentrates.

The Government put heavy emphasis on conversion of oil-fired installations to coal fired. Sugar refineries, cement plants, powerplants, and foundries were affected. Changes in the mining investment code by the Moroccan Department of Energy were to give substantial advantages for the underground stockpiling of hydrocarbons.

In March 1983, the Government imposed import controls as part of austerity measures to conserve foreign currency reserves. The budget was also revised in July, and a freeze was put on civil service employment, reductions were made in Government borrowing and spending, and personal taxes were increased. It also rescheduled some long- and medium-term debts.

PRODUCTION AND TRADE

Phosphate rock output increased, mainly from Bou Craa and Ben Guerir. Output of coal, copper, fluorspar, iron ore, salt, and silver also increased. Barite production was down sharply, mainly owing to a decrease in demand for drilling muds in the United States.

Complete trade returns were unavailable for 1983, but sharp increases in imports of sulfur and coal occurred. Phosphate rock was the main export item in both volume and value. Of about 14 million tons of phosphate rock exported, 66% went to Western Europe, 16% to Eastern Europe, and 11% to Asia.

Table 1.—Morocco: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Antimony concentrate:					
Gross weight	4,384	1,278	1,140	2,011	1,008
Metal content	1,973	550	513	905	454
Cobalt concentrate:					
Gross weight	8,008	6,704	6,265	6,338	--
Metal content	961	838	789	792	--
Copper concentrate:					
Gross weight	[r]23,523	24,067	23,104	63,350	69,213
Metal content	[r]7,057	7,220	6,931	20,905	22,840
Iron and steel:					
Iron ore:					
Gross weight	[r]61,739	78,020	73,112	223,820	252,475
Iron content	39,488	49,933	45,329	138,768	156,535
Metal:					
Pig iron[e]	12,000	12,000	12,000	12,000	15,000
Steel, crude[e]	6,000	6,000	6,000	6,000	6,000
Lead:					
Concentrate:					
Gross weight	[r]165,288	[r]171,377	168,078	147,959	145,000
Metal content	[r]115,702	[r]114,823	115,974	103,571	101,500
Metal:					
Smelter, primary[e]	35,300	40,300	[r]50,100	[r]56,500	56,000
Refined:					
Primary	35,275	40,261	50,149	56,533	56,000
Secondary[e]	1,500	2,100	2,100	2,100	2,000
Total	36,775	42,361	52,249	58,633	58,000
Manganese ore, largely chemical-grade	[r]135,689	131,315	109,647	96,529	73,515
Nickel, Ni content of cobalt ore[e]	160	134	130	127	--
Silver, mine output, metal content thousand troy ounces	3,283	3,154	[e]2,120	[e]2,640	2,850
Tungsten, mine output, metal content kilograms	1,134	3,165	--	--	--
Zinc concentrate:					
Gross weight	[r]12,908	[r]21,443	14,720	22,442	14,000
Metal content[e]	[r]4,500	[r]6,070	[r]7,900	[r]11,200	7,000
NONMETALS					
Barite	[r]286,667	[r]358,311	465,600	515,672	275,000
Cement, hydraulic thousand tons	3,276	3,552	3,702	3,744	3,800
Clays, crude:					
Bentonite	1,015	3,284	2,906	4,457	4,095
Fuller's earth (smectite)	13,586	17,430	19,750	24,604	27,385
Montmorillonite (ghassoul)	5,518	4,271	8,670	4,271	6,037
Feldspar	--	1,594	2,156	1,025	1,000
Fluorspar, acid-grade	63,200	64,400	66,700	50,200	60,300
Mica	363	331	1,805	512	500
Mineral water cubic meters	[r]57,893	[r]69,424	70,240	70,575	70,000
Phosphate rock (includes Western Sahara) thousand tons	[r]20,032	18,824	18,562	17,754	20,106
Pigments, mineral: Natural iron oxide (goethite)	[r]21	121	--	--	--
Pyrites and pyrrhotite, gross weight	197,115	124,576	78,938	--	--
Salt, all types	102,000	67,477	55,197	56,556	69,600
Sulfur, S content of pyrites	63,077	36,052	22,105	--	--
MINERAL FUELS AND RELATED MATERIALS					
Coal, anthracite thousand tons	710	680	703	735	751
Gas, natural:					
Gross million cubic feet	2,666	[e]3,000	[e]3,000	NA	NA
Marketed do.	2,600	[e]2,900	[e]2,400	NA	NA
Petroleum:					
Crude thousand 42-gallon barrels	140	[e]365	[e]300	NA	NA
Refinery products:					
Gasoline do.	3,810	2,980	[e]3,000	NA	NA
Jet fuel do.	2,028	NA	[e]2,100	NA	NA
Kerosine do.	506	NA	[e]500	NA	NA
Distillate fuel oil do.	8,838	8,840	[e]10,200	NA	NA
Residual fuel oil do.	12,399	12,100	[e]12,400	NA	NA
Other do.	1,783	1,800	[e]2,000	NA	NA
Refinery fuel and losses do.	[e]1,650	NA	[e]1,800	NA	NA
Total do.	31,014	NA	[e]32,000	NA	NA

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Includes data available through June 18, 1984.

[2] In addition to the commodities listed, a variety of crude construction materials is produced, but available information is inadequate to make reliable estimates of output levels.

COMMODITY REVIEW

METALS

Cobalt.—Closure of the cobalt mines at Bou Azzer by Compagnie de Tifnout Tiranimine (CTT) in late 1982 was due to termination of the commercial agreement by Métaux Speciaux S.A. of France, which processed the high-arsenic concentrates purchased from CTT. High production costs, low grade of the remaining reserves, and unprofitable treatment of cobalt salts also contributed to its closure. Laboratory equipment and 94 personnel were transferred from Bou Azzer to the nearby Bleida copper mine.

Copper.—Another contract was let on the proposed copper smelter at Agadir. The contract, between Fonderie Marocaine de Cuivre and a Belgian firm, was to study a proposal to produce 50,000 tons of blister copper per year, one-half for export and the remainder to be refined at Agadir. Fonderie Marocaine was a newly formed society with responsibility for the planning and construction of the smelter.

Gold.—The Tiouit Mine, a small mine near Boumalne du Dades in Ouarzazate Province, commenced output in 1982 with 1,572 tons of concentrate. Output in 1983 was 1,517 tons of concentrate containing about 10,000 troy ounces of gold, 65,000 troy ounces of silver, and 180 tons of copper.

A vein deposit near Cheaba was reported to contain 0.305 troy ounce of gold and 3.6 troy ounces of silver per ton. A drilling program also revealed the presence of pyrite and chalcopyrite.

Lead and Zinc.—The Société des Fonderies de Plomb de Zellidja (FPZ) launched a study to determine costs of treating 120,000 to 160,000 tons per year of concentrate if the current facility was expanded. Throughput capacity was about 75,000 tons per year of locally produced concentrate.

Compagnie Minière de Touissit (CMT) operated the Beddiane and Oued Mekta Mines in northeast Morocco. Output from Oued Mekta was being expanded as production from Beddiane declined. Total mine output in 1981, the latest year available, was 389,728 tons. Lead concentrate output was 68,124 tons grading 69% lead, 2% copper, and 12 troy ounces of silver per ton. Copper concentrate was 2,549 tons grading 37% copper, 8% lead, and 32 troy ounces of silver per ton. Mixed concentrates totaled 7,051 tons grading 52% lead, 12% copper, and 20 troy ounces of silver per ton. The gravity section of the plant at Touissit was modified to improve separation between lead and copper. About 67,000 tons of concentrate was shipped by CMT to FPZ for smelting. The remainder, mainly mixed and copper concentrates, was exported. CMT continued exploration for new reserves southeast of Beddiane, where 380,000 tons of ore grading 14% lead was discovered.

Exploration underway at Jbel Khetem resulted in an estimated reserve of 1,077,000 tons grading 3.3% lead and about 2 troy ounces of silver per ton. The result of a drilling program at Tiouli estimated reserves of 700,000 tons grading 6% zinc.

Silver.—Société Metallurgique d'Imiter completed installation of new agitators at the Imiter Mine. Trial runs and modifications were underway to expand throughput to 200 tons per day from 150 tons per day. New mine equipment was also being installed. The total reserve at Imiter was 2.7 million tons containing about 45 million troy ounces.

BRPM conducted a number of exploration programs primarily aimed at expanding discovery and development of precious metals. At Kondiat el Blida, proved reserves were 96,700 tons of ore grading 16 troy ounces of silver per ton, 0.8% lead, and 1.1% zinc. Probable reserves were 50,000 tons grading 8.3 troy ounces of silver per ton. At Sidi Flah, site of ancient workings similar to Imiter and Zgounder, a drilling and pitting program resulted in silver grades ranging from 5 to 56 troy ounces per ton. A mapping program in a scale of 1:2000 covering 22 square kilometers was also underway at Sidi Flah. Other exploration sites included Saghro, Siroua, and Ougnat.

NONMETALS

Cement.—Société Ciments Artificiels de Meknes (Cadem) awarded a $3.4 million contract to Fives-Cail Babcock of the United Kingdom for a 50% expansion of capacity and changeover to the dry cement manufacturing process. Production will increase from 1,000 tons per day to 1,500 tons per day. Crushing and grinding equipment was to be supplied by Loesche GmbH, of the Federal Republic of Germany. Total cost to Cadem for the conversion and expansion was $20.4 million.

Magnesite.—An agreement between BRPM and Geomin of Bulgaria involved the evaluation of magnesite samples from Boudkek. Reserves were increased to 1 million tons grading 44% MgO, with a potential for 9 million tons grading 41% MgO. Laboratory tests have proved the magnesite to be good quality.

Perlite.—A deposit of perlite at Tiedienit was being evaluated following an agreement between BRPM and Czechoslovakia.

Phosphate Rock.—Phosphate rock was mined from four areas in Morocco by the Office Chérifien des Phosphates (OCP): Khouribga, Youssoufia, Ben Guerir, and Bou Craa. Khouribga was the largest producer followed by Youssoufia. Bou Craa, in Western Sahara, recommenced output at 33,734 tons in 1982.

Ambitious expansion plans realized for both rock and fertilizer production have resulted in unused capacity and large stocks owing to weak world demand. About 14 million tons was reportedly stockpiled.

Tenders were let for the Maroc Phosphore 3 and 4 fertilizer complexes at Jorf Lasfar. Design plans included two 100,000-ton-per-year superphosphate plants, a 1-million-ton-per-year diammonium phosphate unit, and one 400,000-ton-per-year triple superphosphate unit. The plants will consume 4 million tons per year of rock and an additional 240,000 tons per year of ammonia. Products and additional phosphate rock reportedly were mainly destined for the U.S.S.R.

Sulfur.—The fertilizer complex at Jorf Lasfar was to have added a $200 million sulfuric acid plant. A consortium of Japanese and Spanish firms signed contracts with OCP for its construction. In 1982, Morocco imported 1,026,697 tons of sulfur valued at $132 million to supply its sulfuric acid plants. Local supplies of sulfur were negligible.

MINERAL FUELS

Coal.—A $10 million exploration contract was signed with Oceaneering International of the United Kingdom. The contract was part of a continuing program aimed at establishing the reserve base for coal in the Jerada coal basin. The National Energy Commission had responsibility for decisions relating to coal research.

The Jerada anthracite coal mine was the only coal producing mine in Morocco and was operated by Charbonnages du Maroc. Output was up slightly in 1983 despite a mine accident that killed nine workers and injured eight others. Modernization of the mine continued. Increased demand for coal and coke was being met by imports and slow expansion underway at Jerada. Higher use of coal in plants and utilities in Casablanca was causing an air pollution problem. Replacement of oil by coal in sugar refineries, cement plants, and other installations has caused a large increase in imports. About 280,000 tons was imported, compared with about 26,000 tons in 1982. Increased quantities of coke were also being imported.

Petroleum.—The Société Marocaine des Industries de Raffinage continued construction of a lubrication unit at Mohammedia. Output was to be 100,000 tons of lubricants, 100,000 tons of asphalt, and 25,000 tons of paraffin. Morocco imported all its lubricant requirements, about 360,000 barrels.

Uranium.—Work continued on byproduct recovery of uranium from the phosphoric acid plant at Maroc Chemie and Maroc Phosphore 1. About 250 tons of U_3O_8 per year was planned for recovery.

Arab Mining Co. suspended its involvement with BRPM in uranium exploration at Jbel Waffaga in the Western High Atlas following poor exploration results. About 2,000 tons of uranium as carnotite and pitchblende in ore grading 0.15% to 0.2% U_3O_8 had been recorded.

Exploration for uranium in the western area of the Ouarzazate Tertiary Basin was abandoned, and focused on the eastern area where uranium vanadate was discovered. Geologic studies of the Jbel Istefan area indicated an unfavorable environment for uranium concentration.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Moroccan dirhams (DH) to U.S. dollars at the rate of DH8.06=US$1.00 in 1983.

The Mineral Industry of Namibia

By Miller W. Ellis[1]

Namibia continued to be the fourth largest producer of minerals on the African continent in terms of total value. It declined in rank to the world's sixth largest producer of gem diamonds, having lost its third-place standing because of increased production in Botswana, Zaire, and Australia. Namibia's diamonds were produced by De Beers Consolidated Mines Ltd.'s subsidiary, Consolidated Diamond Mines (Pty.) Ltd. (CDM). Uranium concentrate was produced by Rossing Uranium Ltd. (RUL), managed by the British firm Rio Tinto-Zinc Corp. Ltd. (RTZ). Most of the base metals and silver were products of Tsumeb Corp. Ltd. (TCL), managed and partly owned by Newmont Mining Corp. of the United States, but coowned by Gold Fields of South Africa Ltd. (GFSA). The South African Iron and Steel Industrial Corp. Ltd. (Iscor) was the country's second largest producer of base metals destined for consumption in its galvanizing and tinplate factories in Vanderbijlpark, Republic of South Africa.

More than 65% of Namibia's gross domestic product of $1.35 billion[2] was accounted for by its mineral industry. The gross value of diamond output was estimated at $480 million, and uranium at $260 million. TCL's gross sales were valued at $109.5 million, and the zinc, lead, and tin produced by Iscor's Namibian mines had a value of about $45 million. Virtually all the country's mineral output was sold to consumers in the Republic of South Africa, the United States, and Western Europe, with a value amounting to more than 65% of the total value of all exports. Mineral tax and income tax on mineral profits supplied more than 50% of public revenue.

GFSA continued to supplant U.S. investments in Namibian minerals in February 1983 by purchasing 15.1% of TCL shares from AMAX Inc., of the United States, for $14.5 million. At yearend, TCL's principal shareholders were GFSA, 43%; Newmont, 29.6%; and the British Petroleum Corp. Ltd.'s subsidiary, BP Minerals International Ltd., 14.2%, with South African firms holding most of the remaining shares. Namibia's mining industry continued to employ about 18,000 workers or nearly 5% of the country's labor force. Skilled and experienced miners and technical workers remained in short supply but were being trained from the small but increasing number of local apprentice candidates. Many of these obtained their academic qualifications at the Valombola Technical Institute at Owambo, established by CDM in 1979 at a cost of nearly $2 million. CDM in 1983 also donated $5.7 million to the construction of Concordia College in Windhoek, the first state-run school in the country for students of all races. At yearend, enrollment at Valombola was about 100, and at Concordia, 280. A technical training center operated by TCL handled 76 apprentice trainees of all races during the year, and, of the 900 other TCL employees attending other training courses, 90% were black. Literacy classes at TCL's Adult Education Center were attended by more than 200 students. TCL awarded scholarships to 14 new University and Technikon students and announced that 7 scholarship holders had completed their studies during the year. TCL had 1,375 skilled and 3,916 semi and unskilled employees at yearend, 6% and 18%, respectively, less than in 1982.

The Chamber of Mines of South West Africa/Namibia[3] reported 1983 as a year of consolidation rather than progress. The mining industry's labor force diminished by nearly 14% to 16,900 workers, largely because of the closure of the Matchless Mine, which displaced more than 900 employees. Taxes paid by the mining industry during the fiscal year ended March 31, 1983, declined more than 40% in terms of local currency to about $18 million, exclusive of $3.6 million in diamond export tax. Revenue from RUL was expected to increase during the remainder of the year.

Production by the major companies was maintained at nearly the previous years levels with a high standard of work performance and a good safety record. Prospecting and exploratory drilling, as well as employee education and training, were continued at high levels and were not adversely affected by the continued low metal prices in the world's markets.

In 1983, the Bureau of Mines published a report on Namibia that provides details of the production history, structure, and resource position of Namibia's mineral industry.[4]

PRODUCTION AND TRADE

The average sales prices for TCL's copper and silver were slightly improved over those of 1982, but the lead price averaged more than 20% below that of 1982. The value of local currency increased about 10% in relation to the U.S. dollar, and the resulting increase in costs of equipment and supplies for mineral exploration and production caused a slight increase in TCL's overall net loss for 1983. Copper production and sales were up 11% and 6%, respectively, but smelter production of TCL's lead decreased 27%, although total sales of lead, which included nearly 13,000 tons of lead smelted by TCL from purchased concentrate, rose by nearly 8%. TCL's sales of nearly 2.7 million troy ounces of silver included as much as 100 troy ounces of silver per ton in its blister copper and up to 35 troy ounces per ton in the smelter lead. The smelter products were shipped via the South African Transport Services railroad to export facilities in the enclave of Walvis Bay. Total sales of 38,752 tons of blister copper, 40,692 tons of refined lead, and nearly 2.7 million troy ounces of silver were consigned to overseas customers, mostly in the United Kingdom, the United States, and Western Europe. CDM's diamonds were marketed by the De Beers Central Selling Organization via the Republic of South Africa and the United Kingdom. RUL's uranium concentrate continued to be marketed through Walvis Bay to customers in Western Europe and Japan.

In September, the Botswana Government invited eight overseas consulting firms to tender for conducting detailed feasibility studies of a trans-Kalahari desert rail link to "a new coal terminal on the Namibian coast." An offshore coal terminal at Walvis Bay and rerouting of the existing line west from Gobabis through Okahandja, 50 kilometers north of Windhoek, were suggested possibilities.

Table 1.—Namibia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982^{p}	1983^{p}
METALS[2]					
Arsenic, white[3]	2,221	1,288	1,370	1,895	1,126
Cadmium metal, refined	81	69	--	110	51
Copper:					
Mine output, metal content of concentrate	^{r}41,900	^{r}39,200	46,185	49,800	50,447
Metal, blister	42,707	40,004	39,719	49,767	54,238
Gold, metal content of smelter products	^{e}6,500	^{e}6,000	^{e}6,000	7,395	7,460
Lead:					
Mine output, metal content of concentrate	44,200	50,200	46,900	32,900	38,467
Metal, refined	41,695	42,654	41,729	40,590	35,416
Silver: Mine output, metal content of concentrate thousand troy ounces	3,617	3,365	3,456	2,812	3,535
Tin, mine output, metal content of concentrate	1,042	1,070	1,228	1,326	1,400
Tungsten, mine output, metal content of concentrate^{e}	165	150	--	--	--
Uranium, U_3O_8 content of concentrate	4,518	4,763	4,681	4,454	^{e}4,450
Zinc, mine output, metal content of concentrate	^{r}23,200	31,908	29,600	^{e}32,200	33,526

See footnotes at end of table.

Table 1.—Namibia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[p]
NONMETALS					
Diamond:[4]					
Gem[e] thousand carats	1,570	1,482	1,186	963	915
Industrial[e] do.	83	78	62	51	48
Total do.	1,653	1,560	1,248	1,014	963
Lime	NA	NA	NA	1,150	600
Limestone and marble	NA	NA	NA	2,800	2,300
Lithium minerals:					
Amblygonite	NA	NA	NA	80	50
Lepidolite	NA	NA	NA	60	30
Petalite	NA	NA	NA	900	700
Total	NA	NA	1,263	1,040	780
Mica	NA	NA	NA	--	100
Quartz	NA	NA	NA	3,500	150
Salt	[e]230,000	[e]230,000	193,000	184,000	136,900
Sulfur: S content of pyritic concentrate	3,538	3,692	8,361	58,209	80,719

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through July 15, 1984.

[2]Data are compiled from the Annual Report of the Chamber of Mines of South West Africa/Namibia and from operating company annual reports as follows: Tsumeb Corp. Ltd. (TCL), South African Iron and Steel Industrial Corp. Ltd. (Iscor), Falconbridge Nickel Mines Ltd., Rio Tinto-Zinc Corp. Ltd. (RTZ), and others as available.

[3]White arsenic equivalent of all arsenic products reported as being produced.

[4]Total figures reported by De Beers Consolidated Mines Ltd. in company annual reports for calendar years. Details on gem and industrial diamonds are estimates, assuming output to be 95% gem quality.

COMMODITY REVIEW

METALS

Copper and Silver.—The country's second largest producer of copper and major producer of silver, as well as lead, cadmium, and arsenic, continued to be TCL's historic Tsumeb Mine, where ore production was 30% greater than that of 1982. The increase was due to a resumption of mining in the upper levels, pulling of crown and sill pillars, and mining of lower levels after completion of a waste and ore bypass system above the 44 level. Additional ore was accessible from development of the 42 level main haulage and from stopes on the 39 and 40 levels after completion of the main 39-40 ramp.

The Tsumeb mill treated 501,513 tons of ore and produced 31,767 tons of copper concentrate containing 28% copper and 26 troy ounces of silver per ton. The nearby Kombat mill treated 282,540 tons of ore containing 4.03% copper from the Kombat and Asis West Mines to recover 26,084 tons of copper concentrate with 36% copper and nearly 12 troy ounces of silver per ton. An additional 27,854 tons of ore containing 4.72% copper from Asis West, produced on behalf of the part owner, Tsumeb Exploration Co. Ltd. (TECO), was also treated at the Kombat mill. The 3,078 tons of copper concentrate recovered contained 39% copper and more than 11 troy ounces of silver per ton. TCL's Matchless Mine, located 32 kilometers southwest of Windhoek, produced 107,602 tons of 1.84% copper pyritic ore from which its mill recovered 8,784 tons of concentrate containing 21% copper, 32% sulfur, and nearly 2.4 troy ounces of silver per ton before it shut down in December.

The Otjihase Mine, 70% owned by TCL and located 27 kilometers northeast of Windhoek, continued as TCL's largest ore and copper producer with 756,996 tons of 1.93% copper ore. The Otjihase mill recovered 53,323 tons of copper concentrate with 26% copper, 35% sulfur, and 2 troy ounces of silver per ton, as well as pyritic concentrate with 0.3% copper and 50% sulfur, sold to RUL for its sulfuric acid plant. TCL's No. 1 copper smelter produced 25,988 tons of blister copper, all from TCL concentrate, while the No. 2 copper smelter produced 28,250 tons of blister copper, only 2,235 tons of which was from TCL concentrate. Of the 15,059 tons of blister from Otjihase concentrate, 10,541 tons was for TCL's 70% interest and the remaining 4,518 tons was toll smelted for the minority shareholders, chiefly Johannesburg Consolidated Investment Co. Ltd. The No. 2 smelter also produced 9,555 tons of blister copper on toll for other copper mines and purchased concentrate from which 1,401 tons of blister copper was smelted. TCL's copper concentrate contained a total of 1.3 million troy ounces of silver recoverable in its blister copper, and nearly 630,000 troy ounces of silver was contained in TCL's lead and zinc concentrate. Available data indicated that more than 1 million troy ounces of silver was contained in Rosh Pinah's lead and zinc concentrates.

Klein Aub Koper Maatskappy Bpk., a subsidiary of General Mining Union Corp. Ltd. of the Republic of South Africa, produced 10,000 tons of copper concentrate at its mine and mill, 100 kilometers south of Rehoboth. The concentrate was toll smelted at Tsumeb and yielded 5,000 tons of blister copper containing 385,800 troy ounces of silver. The Oamites Mine, 55 kilometers south of Windhoek, operated by the South African firm Metorex Mining Co., produced 13,000 tons of copper concentrate, also smelted at Tsumeb to yield 4,000 tons of copper and 192,900 troy ounces of silver.

Table 2.—Namibia: Gross weight and elemental content of ore and concentrate produced in 1983, by mine

(Metric tons unless otherwise specified)

Mine	Gross weight	Elemental content: Copper	Lead	Zinc	Sulfur	Silver (troy ounces)
Asis West:						
Ore	27,854	1,315	315	--	NA	NA
Concentrate:						
Copper	3,078	1,186	175	--	NA	34,636
Lead	132	12	48	--	NA	327
Klein Aub:						
Ore^e	230,000	5,700	--	--	NA	NA
Concentrate: Copper	10,000	5,000				385,800
Kombat:						
Ore	282,540	11,368	5,142	--	NA	NA
Concentrate:						
Copper	26,084	9,515	2,152	--	NA	315,805
Lead	6,000	801	1,782	--	NA	22,377
Matchless:						
Ore	107,602	1,980	--	--	13,020	NA
Concentrate: Copper	8,784	1,860	--	--	2,775	20,898
Oamites:						
Ore^e	390,000	4,400	--	--	NA	NA
Concentrate: Copper	13,000	4,000	--	--	--	192,900
Otjihase:						
Ore	756,996	14,610	--	--	148,447	NA
Concentrate:						
Copper	53,323	13,619	--	--	18,482	109,720
Pyrite	118,238	367	--	--	59,462	--
Rosh Pinah:						
Ore^e	200,000	--	17,000	34,000	NA	NA
Concentrate:						
Lead	24,000	--	11,600	^{e}1,440		^{e}514,400
Zinc	55,000	--	^{e}4,400	29,000	--	^{e}508,000
Tsumeb:						
Ore	501,513	15,998	21,966	7,172	NA	NA
Concentrate:						
Copper	31,767	8,914	2,357	--	NA	824,215
Lead	52,764	5,166	15,945	3,044	NA	605,615
Zinc	90	7	8	42	NA	735
Total:						
Ore	XX	55,371	44,423	41,172	161,467	NA
Concentrate	XX	50,447	38,467	33,526	80,719	3,535,428

^{e}Estimated. NA Not available. XX Not applicable.

Lead and Zinc.—TCL's Tsumeb Mine was the country's largest producer of lead. Its neighbors, the Kombat and Asis West Mines, also exploited complex sulfide ore deposits containing lead, zinc, copper, arsenic, cadmium, silver, and other valuable constituents. Tsumeb's 501,513 tons of ore contained 4.38% lead and 1.43% zinc, of which the Tsumeb mill recovered 52,764 tons of lead concentrate with 30% lead and 11 troy ounces of silver per ton, and 90 tons of zinc concentrate with 47% zinc and 8 troy ounces of silver per ton. The Kombat and Asis West Mines' production of 282,540 tons of 1.82% lead ore yielded 6,000 tons of lead concentrate with 30% lead and 3.7 troy ounces of silver per ton. The Kombat mill also treated 27,854 tons of 1.13% lead ore from the Asis West Mine, on behalf of TECO, and recovered 132 tons of 36% lead concentrate with nearly 2.5 troy ounces of silver per ton. The TCL lead smelter output included 22,491 tons of refined lead from TCL concentrate and 12,925 tons of lead from purchased concentrates.

The Rosh Pinah open pit mine, 27 kilometers north of the Orange River, was owned and managed by Imcor Zinc (Pty.) Ltd., a subsidiary of Iscor. It continued to be Namibia's top zinc producer and second largest lead producer with 55,000 and 24,000 tons of zinc and lead concentrates, respectively, in 1983. The concentrates were hauled 160 kilometers north to Aus, on the Lüderitz-Keetmanshoop railroad. The lead concentrate was shipped north to Tsumeb for toll smelting, and the zinc concentrate was shipped to GFSA's Zincor refinery at Springs in the Republic of South Africa. The resulting zinc metal was shipped to the galvanizing section of Iscor's Vanderbijlpark steel complex.

Tantalum and Tin.—Iscor's subsidiary, Industrial Minerals Mining Corp. (Pty.) Ltd., continued to operate the Uis tin mine, 160 kilometers north of Swakopmund, and reported an output of 1,179 tons of tin concentrate (cassiterite) during fiscal 1982-83. The concentrate was shipped to the tinplate section of Iscor's Vanderbijlpark steel complex. Some of the tantaliferous slag reportedly produced by Iscor may have been derived from this concentrate. Reexamination and sampling of the Uis tin deposit during the past 4 years has cost in excess of $1 million and indicated the presence of 63 million tons of exploitable ore containing 0.136% tin and 24 million tons of possible ore with 0.127% tin.

NONMETALS

Diamond.—CDM's production of diamonds declined 5% compared with the 20% production slump in both 1981 and 1982. The Orangemund operation involved stripping more than 17 million tons of overburden, in order to mine, crush, and treat 9.6 million tons of conglomeratic "ore" containing 10.04 carats per 100 tons, from which 962,752 carats of diamonds was recovered. Indurated overburden in the No. 2 plant area was stripped by a moving belt loader at an average rate of 1,550 tons per hour. The No. 3 plant was closed throughout the year, and the small sampling plant was dismantled and used for spare parts. The foreshore mining face at the No. 4 plant was extended 130 meters seawards of high water mark. The National Occupational Safety Association awarded CDM a five-star rating for the fifth consecutive year.

Lithium and Salt.—Metramco Ltd. of the Republic of South Africa continued as the major shareholder of SWA Lithium Mines (Pty.) Ltd., which extracted lithium minerals as well as quartz and mica from a number of pegmatite deposits, including the Helicon, in the Karibib area northwest of Windhoek. Glass and ceramic manufacturers in the United Kingdom and Western Europe were the principal consumers.

Rock salt recovered from recent and ancient evaporite deposits along the coastal lagoons, or from seawater brines pumped into manmade pans, was harvested and marketed by SWA Salt Co., Koes Soutwerke, and other small firms, mostly South African managed.

MINERAL FUELS

Production at RTZ's Rossing uranium mine northeast of Swakopmund was estimated at 4,450 tons of U_3O_8 concentrate, about the same as that of 1982. Operating costs increased and pretax profits were down 40% to $94.8 million, largely owing to the increased value of the dollar in which uranium prices are quoted. Net profit was reported as $22.15 million, indicating a tax load of nearly $73 million. The operation was reportedly the world's largest open pit uranium mine, and its production placed Namibia as the Western World's fourth largest uranium producer.

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[1] Physical scientist, Division of Foreign Data.

[2] Central Intelligence Agency. World Factbook 1984. P. 161, col. 1.

Where necessary, values have been converted from South African rand (R) to U.S. dollars at the rate of R1=US$0.9228 for 1982 and R1=US$0.8991 for 1983. International Financial Statistics. V. 37, No. 6, p. 400.

[3] Chamber of Mines of South West Africa/Namibia. 5th Annual Report. 1983, p. 1.

[4] Coakley, G., S. Ambrosio, P. Clarke, M. Ellis, E. Shekarchi. Namibia. BuMines Minerals Perspectives, 1983, 57 pp.

The Mineral Industry of the Netherlands

By George A. Rabchevsky[1]

The Netherlands was one of the world's most affluent countries and was among the top 10 in per capita income in 1983. Mineral processing, metal manufacturing, and mineral transportation through excellent port facilities continued to play an important role in the economy. The economy struggled for a third year, however, with gross national product (GNP), at $130 billion[2] at 1982 prices, growing by less than 1%. All sectors were stagnant, except the energy sector, which showed moderate gains. This slight growth was attributed to improved trade with the Federal Republic of Germany and the United States. Nonfuel minerals contributed little to the Netherlands economy, but the output and export of iron, steel, and lead increased. Unemployment, at over 800,000 workers, crept up to 17%, once again the highest in the European Economic Community (EEC), surpassing the former postwar record of 16% in 1982. In the mineral industry, steel led in the number of layoffs, because of capacity reductions and reorganization.

PRODUCTION

Industrial production rose only about 2% after 2 years of decline, most of it concentrated in the energy sector, such as natural gas, oil refining, and petrochemicals. Steel and lead production also rose slightly, while almost all other metal and nonmetal commodities were either stagnant or declined. Overall consumption of commodities also increased slightly.

Table 1.—Netherlands: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum metal:					
Primary	257,719	258,621	261,983	250,925	[3]235,650
Secondary	[r]40,068	47,133	50,217	49,825	48,000
Cadmium metal	416	455	518	497	[3]521
Iron and steel:					
Sintered ore (from imported ore) thousand tons	2,929	2,723	3,042	2,512	[3]2,650
Pig iron do	4,814	4,328	4,600	3,617	[3]3,748
Steel, crude do	5,806	5,272	5,472	4,354	[3]4,478
Semimanufactures do	4,993	4,475	4,732	3,886	4,000

See footnotes at end of table.

Table 1.—Netherlands: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS —Continued					
Lead metal:					
Smelter[e]	6,800	6,000	2,500	2,500	2,500
Refined:					
Primary	16,432	13,902	7,015	10,821	10,900
Secondary	[r]18,568	[r]18,098	16,985	22,179	24,100
Total	[r]35,000	[r]32,000	24,000	33,000	35,000
Tin metal, refined:[e]					
Primary	[r]1,700	[r]1,000	[r]2,700	[r]2,700	2,750
Secondary	180	180	180	180	[3]180
Zinc metal (slab), primary	153,982	169,539	177,363	186,022	[3]187,519
NONMETALS					
Cement, hydraulic thousand tons	3,701	3,745	3,316	3,103	2,980
Nitrogen: N content of ammonia do	1,916	1,874	1,814	1,655	[3]1,744
Salt, all types do	3,951	3,464	3,578	3,191	3,040
Sand, industrial do	23,033	24,608	20,000	17,359	18,000
Sodium compounds:					
Sodium carbonate[e] do	420	420	420	420	420
Sodium sulfate, synthetic do	50	50	50	50	50
Sulfur:					
Elemental byproduct:					
Of metallurgy[e] do	88	90	90	[r]100	100
Of petroleum do	70	52	55	65	75
Total do	158	142	145	165	175
Sulfuric acid, 100% H_2SO_4 do	1,744	1,726	1,726	1,609	1,530
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	93,000	95,300	97,800	82,700	100,000
Coke thousand tons	2,528	2,455	2,242	2,428	[3]2,120
Gas:					
Manufactured, all types[4] million cubic feet	[r]260,594	[r]234,326	220,463	272,739	265,400
Natural:					
Gross do	3,407,425	3,219,023	2,988,165	2,543,844	2,667,000
Marketed do	3,320,575	[r]3,211,067	2,981,455	2,548,223	2,500,000
Natural gas liquids thousand 42-gallon barrels	[r]3,074	[r]3,341	2,970	2,981	3,500
Peat[e] thousand tons	400	400	400	400	400
Petroleum:					
Crude thousand 42-gallon barrels	8,970	8,724	9,188	11,158	17,600
Refinery products:					
Gasoline do	[r]65,016	[r]62,577	56,740	62,471	68,000
Jet fuel do	[r]28,024	[r]26,408	23,336	26,408	28,700
Kerosine do	[r]4,224	[r]3,015	2,519	3,162	3,500
Distillate fuel oil do	[r]139,748	[r]118,383	85,693	100,658	108,000
Residual fuel oil do	[r]120,133	[r]97,609	74,805	76,796	83,000
Lubricants do	3,955	[r]3,850	3,542	3,290	3,600
Liquefied petroleum gas do	[r]19,813	[r]17,342	16,634	11,983	13,000
Naphtha do	15,419	7,404	9,137	27,540	28,000
Bitumen do	5,563	5,327	3,127	4,575	5,000
Other do	[r]24,961	[r]17,275	16,213	9,186	10,000
Refinery fuel and losses do	[r]27,189	[r]25,542	23,092	27,389	29,200
Total do	[r]454,045	[r]384,732	314,838	353,458	380,000

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through May 1984.

[2] In addition to the commodities listed, a variety of crude construction materials (clays, stone, and gravel) are also produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

[4] Coke oven and blast furnace gas only.

TRADE

Foreign trade accounted for nearly 60% of the Netherland's GNP in 1983. Led by fuels, trade improved markedly, by 4%, with a surplus amounting to approximately $4 billion. The most significant export increases were oil products, which rose by almost 14% following an increase of 5.5% in 1982, and chemical products, which increased more than 9% after no growth in 1982. The Netherland's gas exports, which provided an important part of Europe's gas supply, also rose slightly. The success was partially owing to the economic recovery of the United States, with exports to the United States rising 40% in value in the first 9 months of 1983.

The Netherlands remained the third largest market in Europe for U.S. exports, and was the second largest investor in the U.S. economy. Imports from the United States during the year amounted to about $8.5 billion and exports to the United States amounted to about $2.5 billion. In the minerals industry, although U.S. coal exports to the Netherlands were relatively high in 1982, in 1983 the increases were in fuel oil, tin, lead, and nickel. U.S. imports of primary steel from the Netherlands in 1982 dropped by almost 50%.

Table 2.—Netherlands: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	12,502	4,268	--	West Germany 1,392; Sweden 1,167.
Oxides and hydroxides	40,331	47,006	--	West Germany 15,057; Italy 8,400.
Ash and residue containing aluminum	6,320	6,335	--	West Germany 4,411; France 854.
Metal including alloys:				
Scrap	74,788	73,669	250	West Germany 40,110; Belgium-Luxembourg 14,257; France 14,090.
Unwrought	351,995	350,802	318	Belgium-Luxembourg 121,314; France 96,222; West Germany 74,177.
Semimanufactures	93,617	89,744	2,773	West Germany 40,213; France 12,606; Belgium-Luxembourg 12,304.
Antimony: Oxides	213	331	NA	West Germany 284.
Arsenic: Metal including alloys, all forms	9	48	--	West Germany 19; France 12.
Bismuth: Metal including alloys, all forms	33	55	NA	U.S.S.R. 45.
Cadmium: Metal including alloys, all forms	505	646	171	France 251; Belgium-Luxembourg 100.
Chromium:				
Ore and concentrate	26,577	21,130	--	West Germany 8,793; France 5,875.
Oxides and hydroxides	241	439	6	United Kingdom 169; Ireland 85.
Cobalt:				
Oxides and hydroxides	60	40	--	Romania 10; West Germany 9.
Metal including alloys, all forms	48	117	NA	United Kingdom 61.
Columbium and tantalum:				
Ore and concentrate	--	243	--	U.S.S.R. 170; Belgium-Luxembourg 22.
Ash and residue containing columbium and/or tantalum	--	158	--	All to West Germany.
Metal including alloys, all forms, tantalum	4	4	4	
Copper:				
Ore and concentrate	87	70	--	Belgium-Luxembourg 47; France 23.
Oxides and hydroxides	--	157	NA	Belgium-Luxembourg 83; West Germany 35.
Sulfate	754	1,223	--	Belgium-Luxembourg 529; Ireland 232.
Ash and residue containing copper	6,320	5,331	--	West Germany 2,436; Belgium-Luxembourg 2,178.
Metal including alloys:				
Scrap	57,388	53,616	25	West Germany 27,494; Belgium-Luxembourg 17,830.
Unwrought	11,187	5,386	89	West Germany 1,914; Italy 1,541.
Semimanufactures	50,622	48,761	11,542	West Germany 10,656; United Kingdom 5,024; France 4,466.

See footnotes at end of table.

Table 2.—Netherlands: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Gallium: Metal including alloys, all forms value	--	$88,383	--	United Kingdom $40,446.
Germanium: Metal including alloys, all forms do	$58,112	$53,554	--	United Kingdom $51,682.
Gold:				
Waste and sweepings value, thousands	$24,064	$18,939	--	West Germany $9,017; Spain $5,806.
Metal including alloys, unwrought and partly wrought troy ounces	980,798	894,036	--	Switzerland 698,567; Belgium-Luxembourg 56,674; France 47,714.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	239,702	148,861	--	West Germany 143,573.
Metal:				
Scrap thousand tons	1,252	1,180	(2)	West Germany 438; Belgium-Luxembourg 217; Spain 202.
Pig iron, cast iron, related materials	5,516	5,072	2	Denmark 3,253.
Ferroalloys:				
Ferrochromium	18,243	13,990	--	West Germany 9,187; France 4,731.
Ferromanganese	2,220	142	--	West Germany 140.
Ferromolybdenum	103	14	--	Italy 11.
Ferronickel	139	(2)	--	NA.
Ferrosilicochromium	4	8	--	NA.
Ferrosilicomanganese	377	2,064	--	West Germany 2,054.
Ferrosilicon	2,391	1,234	--	West Germany 892; Belgium-Luxembourg 160.
Silicon metal	1,827	2,464	--	West Germany 2,395; Italy 51.
Unspecified	271	216	--	West Germany 108; France 40.
Steel, primary forms thousand tons	2,075	1,494	135	Belgium-Luxembourg 238; West Germany 187; Spain 186.
Semimanufactures:				
Bars, rods, angles, shapes, sections	489,472	457,739	12,063	Belgium-Luxembourg 132,121; West Germany 119,329.
Universals, plates, sheets	1,614,472	1,476,238	151,250	West Germany 267,707; United Kingdom 223,233; Belgium-Luxembourg 211,148.
Hoop and strip	113,542	110,897	83	West Germany 60,917; Switzerland 14,192.
Rails and accessories	37,355	30,296	--	Italy 22,729; West Germany 4,146.
Wire	60,064	59,040	1,388	West Germany 14,078; France 13,103.
Tubes, pipes, fittings	571,927	423,476	7,659	West Germany 11,254; Saudi Arabia 46,213; Belgium-Luxembourg 44,481.
Castings and forgings, rough	28,294	25,390	223	Belgium-Luxembourg 18,077; West Germany 6,379.
Lead:				
Oxides	6,635	7,606	--	West Germany 3,737; Italy 2,791.
Ash and residue containing lead	2,682	3,689	--	Belgium-Luxembourg 1,512; West Germany 1,315.
Metal including alloys:				
Scrap	33,604	26,835	--	West Germany 12,280; France 6,977.
Unwrought	13,768	14,145	50	West Germany 8,226; Spain 1,540.
Semimanufactures	1,774	1,821	47	Norway 777; Belgium-Luxembourg 202.
Lithium: Oxides and hydroxides	70	188	NA	West Germany 82; France 76.
Magnesium: Metal including alloys:				
Scrap	1,058	1,018	224	West Germany 511; Italy 133.
Unwrought	4,571	6,957	1	West Germany 4,602; United Kingdom 1,982.
Manganese:				
Ore and concentrate, metallurgical-grade	44,921	42,077	--	West Germany 11,134; Republic of South Africa 2,805; Nigeria 2,582.
Oxides	116	218	3	Denmark 98; France 76.
Metal including alloys, all forms	3,266	3,845	NA	West Germany 1,529; United Kingdom 705; France 696.
Mercury 76-pound flasks	4,350	3,277	--	Belgium-Luxembourg 1,334; United Kingdom 1,073; West Germany 551.
Molybdenum:				
Ore and concentrate	--	14,047	--	Austria 4,732; United Kingdom 2,862.
Oxides and hydroxides	1,546	1,683	NA	Austria 1,207; Belgium-Luxembourg 129.

See footnotes at end of table.

Table 2.—Netherlands: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Molybdenum —Continued				
Metal including alloys:				
Scrap	6	30	5	France 21.
Unwrought	19	62	--	France 40; West Germany 21.
Semimanufactures	124	155	--	Belgium-Luxembourg 62; West Germany 29.
Nickel:				
Matte and speiss	2,602	3,115	--	Italy 24; Switzerland 22; unspecified 3,069.
Oxides and hydroxides	264	375	NA	Romania 39; Hong Kong 21; Indonesia 21.
Ash and residue containing nickel	1,604	1,131	--	Sweden 653; West Germany 239.
Metal including alloys:				
Scrap	1,564	1,808	20	Finland 625; West Germany 495.
Unwrought	3,088	2,495	--	Italy 1,649; West Germany 271.
Semimanufactures	1,088	2,480	1	West Germany 2,259.
Platinum-group metals:				
Waste and sweepings value, thousands	$24,218	$25,794	--	Belgium-Luxembourg $17,757; West Germany $3,732; France $2,898.
Metals including alloys, unwrought and partly wrought troy ounces	31,829	50,566	171	West Germany 23,013; France 11,637.
Silver:				
Waste and sweepings value, thousands	$8,035	$7,999	--	West Germany $3,703; Spain $3,173.
Metal including alloys, unwrought and partly wrought thousand troy ounces	3,736	5,735	43	Belgium-Luxembourg 3,246; West Germany 759.
Tin:				
Ash and residue containing tin	2,792	1,143	--	West Germany 622; United Kingdom 372.
Metal including alloys:				
Unwrought	2,949	1,456	--	West Germany 751; Belgium-Luxembourg 307; United Kingdom 190.
Semimanufactures	723	847	1	West Germany 504; Belgium-Luxembourg 145.
Titanium:				
Ore and concentrate	21,746	22,177	--	France 3,206; West Germany 2,813; Bulgaria 2,768.
Oxides	5,127	3,842	--	Italy 1,990; Belgium-Luxembourg 382.
Metal including alloys:				
Scrap	86	77	NA	United Kingdom 71.
Unwrought	3	3	--	All to United Kingdom.
Semimanufactures	65	21	NA	West Germany 15; Belgium-Luxembourg 3.
Tungsten:				
Ore and concentrate	344	793	--	U.S.S.R. 618; East Germany 95.
Ash and residue containing tungsten	28	65	--	West Germany 45.
Metal including alloys:				
Scrap	138	158	105	France 14; West Germany 13.
Semimanufactures	151	101	1	Belgium-Luxembourg 67.
Zinc:				
Blue powder	3,411	3,395	NA	NA.
Matte	1,028	2,491	--	West Germany 1,497; France 590.
Ash and residue containing zinc	11,811	9,357	--	Belgium-Luxembourg 4,707; West Germany 3,718.
Metal including alloys:				
Scrap	14,840	10,603	--	West Germany 6,305; Belgium-Luxembourg 2,354.
Unwrought	162,867	168,202	9,287	West Germany 32,465; United Kingdom 30,197; France 19,916.
Semimanufactures	4,684	8,119	7	West Germany 4,768; Denmark 816; France 576.
Zirconium:				
Ore and concentrate	24,414	23,690	--	West Germany 12,251; France 4,633.
Metal including alloys, all forms	(2)	66	36	NA.
Other:				
Ores and concentrates	16,768	14,047	--	Austria 4,732; United Kingdom 2,862.
Oxides and hydroxides	2,160	2,426	578	United Kingdom 552; West Germany 270.
Ashes and residues	1,021	2,628	--	West Germany 918; Belgium-Luxembourg 613.

See footnotes at end of table.

Table 2.—Netherlands: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	6,598	5,913	18	Thailand 1,709; United Kingdom 726; France 623.
Artificial: Corundum	79	139	--	West Germany 62; Belgium-Luxembourg 31.
Dust and powder of precious and semiprecious stones including diamond kilograms	103	109	18	Belgium-Luxembourg 21; Italy 20.
Grinding and polishing wheels and stones	4,018	4,291	20	West Germany 794; United Kingdom 769; France 724.
Barite and witherite	86,411	80,306	143	United Kingdom 29,499; Norway 18,983.
Boron materials:				
Crude natural borates	411,759	357,525	--	France 75,476; West Germany 67,993.
Elemental	804	1,152	--	France 857; West Germany 88.
Oxides and acids	919	975	--	West Germany 730; Brazil 30.
Cement	434,173	445,429	(2)	West Germany 194,370; Belgium-Luxembourg 94,804; Nigeria 73,976.
Chalk	30,897	27,499	--	Belgium-Luxembourg 26,437.
Clays, crude:				
Andalusite, kyanite, sillimanite	547	941	NA	United Kingdom 303; Belgium-Luxembourg 131.
Bentonite	31,619	22,687	NA	United Kingdom 2,978; Belgium-Luxembourg 2,865; Egypt 2,654.
Chamotte earth	1,353	875	NA	West Germany 503.
Dinas earth	1	762	NA	West Germany 138.
Kaolin	81,526	94,327	NA	Belgium-Luxembourg 74,397; West Germany 15,120.
Unspecified	67,013	82,325	223	West Germany 50,129; Belgium-Luxembourg 26,966.
Diamond:				
Gem, not set or strung carats	365,219	423,506	72,762	Switzerland 126,304; United Kingdom 67,580.
Industrial do.	677,168	632,768	105,391	Belgium-Luxembourg 158,565; United Kingdom 82,359.
Diatomite and other infusorial earth	492	756	--	Nigeria 213; Japan 123.
Feldspar, fluorspar, related materials:				
Feldspar	2,791	1,251	--	Nigeria 427; Greece 343.
Fluorspar	1,176	1,101	--	West Germany 974; Italy 96.
Unspecified	21,231	19,029	--	West Germany 14,587.
Fertilizer materials:				
Crude, n.e.s	79,985	77,444	--	Belgium-Luxembourg 55,680; West Germany 19,809.
Manufactured:				
Ammonia thousand tons	408	407	--	Belgium-Luxembourg 259; United Kingdom 79.
Nitrogenous do.	2,990	3,237	331	France 1,012; West Germany 828.
Phosphatic do.	305	284	--	France 110; Belgium-Luxembourg 30.
Potassic do.	6	4	--	Oman 2; Belgium-Luxembourg 1.
Unspecified and mixed do.	1,100	1,135	--	France 413; West Germany 199.
Graphite, natural	663	596	4	West Germany 201; East Germany 173.
Gypsum and plaster	1,500	2,756	--	Belgium-Luxembourg 1,233; United Kingdom 838.
Iodine	35	15	--	Iran 3; Canada 2; West Germany 2.
Lime	3,307	5,470	--	West Germany 3,834; Belgium-Luxembourg 779.
Magnesium compounds:				
Magnesite	1,561	20,268	NA	Greece 9,025; Turkey 5,215.
Oxides and hydroxides	638	713	NA	Austria 300; Venezuela 200.
Other	26,169	28,001	170	West Germany 14,351; France 4,748.
Mica: Crude including splittings and waste	3,082	3,110	--	Norway 1,902; West Germany 365.
Nitrates, crude	255	226	--	West Germany 157.
Phosphates, crude	26,250	23,926	--	West Germany 12,428; Belgium-Luxembourg 9,205.
Pigments, mineral: Iron oxides and hydroxides, processed	6,637	6,713	1,599	West Germany 2,482; France 1,035.
Precious and semiprecious stones other than diamond, natural kilograms	6,016	2,482	--	West Germany 1,418; Switzerland 1,000.

See footnotes at end of table.

Table 2.—Netherlands: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Salt and brine ______ thousand tons__	2,298	2,011	--	Belgium-Luxembourg 540; unspecified 990.
Sodium compounds, n.e.s.:				
Carbonate, manufactured________	144,501	132,231	--	West Germany 59,356; Belgium-Luxembourg 12,084.
Sulfate, manufactured __________	14,972	10,611	--	West Germany 3,453; United Kingdom 1,322.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons__	6	6	(2)	West Germany 3; Belgium-Luxembourg 2.
Worked ____________do____	35	29	(2)	West Germany 17; Belgium-Luxembourg 11.
Dolomite, chiefly refractory-grade do____	17	14	--	West Germany 6; Belgium-Luxembourg 5.
Gravel and crushed rock ___do____	3,607	3,182	(2)	Belgium-Luxembourg 2,898.
Quartz and quartzite______do____	14	15	(2)	West Germany 12.
Sand other than metal-bearing do____	8,950	7,357	(2)	Belgium-Luxembourg 7,034.
Sulfur:				
Elemental, crude including native and byproduct_________________	13,689	13,650	--	Belgium-Luxembourg 12,136.
Dioxide____________________	734	1,187	--	Belgium-Luxembourg 543; Netherland Antilles 528.
Sulfuric acid_________________	200,876	194,723	20	Belgium-Luxembourg 96,667; Mexico 23,249.
Talc, steatite, soapstone, pyrophyllite __	14,902	13,926	--	West Germany 6,872; Norway 1,823.
Vermiculite, perlite, chlorite_________	321	1,265	--	Belgium-Luxembourg 1,056.
Other:				
Crude_____________________	184,049	247,776	147	Belgium-Luxembourg 106,222; West Germany 67,981.
Slag and dross, not metal-bearing___	544,822	587,718	1,497	Belgium-Luxembourg 421,418; United Kingdom 79,081.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural _______	9,844	3,103	--	West Germany 3,017.
Carbon: Carbon black ___________	88,918	75,377	46	France 31,319; West Germany 11,298.
Coal:				
Anthracite______ thousand tons__	250	188	--	West Germany 58; Belgium-Luxembourg 57.
Bituminous ____________do____	660	481	--	West Germany 231; Belgium-Luxembourg 189.
Coke and semicoke__________do____	839	673	--	Belgium-Luxembourg 295; West Germany 172.
Gas, manufactured_______________	202,796	167,669	16,830	Belgium-Luxembourg 83,328; Finland 43,661.
Gas, natural_____million cubic feet__	1,752,861	1,379,639	--	West Germany 723,916; Belgium-Luxembourg 244,484; France 207,968.
Peat including briquets and litter_____	167,197	139,120	--	Belgium-Luxembourg 70,567; West Germany 32,995.
Petroleum:				
Crude_ thousand 42-gallon barrels__	340	694	--	Belgium-Luxembourg 382; Portugal 150.
Refinery products:				
Liquefied petroleum gas do____	4,091	5,489	181	West Germany 1,803; Belgium-Luxembourg 1,729.
Gasoline, motor ______do____	70,310	75,531	5,823	West Germany 38,947.
Mineral jelly and wax __do____	643	503	6	West Germany 188; United Kingdom 82.
Kerosine and jet fuel ___do____	21,223	24,421	--	West Germany 9,919; Denmark 4,085.
Distillate fuel oil _____do____	83,559	79,897	220	West Germany 41,199; Belgium-Luxembourg 15,587.
Lubricants __________do____	5,084	4,687	58	Belgium-Luxembourg 1,051; United Kingdom 479.
Residual fuel oil______do____	78,981	90,277	218	United Kingdom 14,867; West Germany 14,833; bunkers 33,587.
Bitumen and other residues do____	1,767	2,444	(2)	West Germany 741; Norway 487.

See footnotes at end of table.

Table 2.—Netherlands: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Bituminous mixtures thousand 42-gallon barrels	252	336	(2)	West Germany 234; Sudan 26.
Petroleum coke do	441	1,330	23	West Germany 617; France 156.
Unspecified do	--	591	5	Belgium-Luxembourg 256; West Germany 69.

NA Not available.

[1] Table prepared by Jozef Plachy.

[2] Less than 1/2 unit.

Table 3.—Netherlands: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	145,039	126,673	799	Greece 110,579; Turkey 7,990.
Oxides and hydroxides	622,560	592,243	219	Suriname 233,832; France 156,439.
Ash and residue containing aluminum	3,778	4,624	NA	West Germany 3,200; East Germany 279.
Metal including alloys:				
Scrap	39,589	41,782	797	West Germany 15,690; United Kingdom 6,434.
Unwrought	161,349	195,502	1	Norway 111,211; West Germany 26,840.
Semimanufactures	95,716	107,927	3,007	West Germany 39,127; Belgium-Luxembourg 27,454.
Antimony:				
Oxides	907	948	--	France 300; United Kingdom 249.
Metal including alloys, all forms	48	85	NA	Belgium-Luxembourg 35; China 20.
Arsenic:				
Oxides and acids	89	97	--	United Kingdom 50.
Metal including alloys, all forms	68	117	--	Sweden 65; France 51.
Cadmium: Metal including alloys, all forms	118	155	--	West Germany 92; China 20.
Chromium:				
Ore and concentrate	18,188	31,335	--	Republic of South Africa 24,845.
Oxides and hydroxides	906	1,295	266	West Germany 507; Italy 250.
Metal including alloys, all forms	46	64	NA	West Germany 17; France 8; Japan 8.
Cobalt:				
Oxides and hydroxides	194	192	23	Belgium-Luxembourg 133; United Kingdom 22.
Metal including alloys, all forms	44	140	3	West Germany 56; Belgium-Luxembourg 14.
Copper:				
Ore and concentrate	1	59	--	Belgium-Luxembourg 50; West Germany 8.
Matte and speiss including cement copper	126	19	--	All from West Germany.
Oxides and hydroxides	612	451	7	Italy 213; West Germany 91.
Sulfate	4,580	4,313	--	U.S.S.R. 1,901; Belgium-Luxembourg 1,496.
Ash and residue containing copper	960	1,610	NA	Belgium-Luxembourg 847; West Germany 631.
Metal including alloys:				
Scrap	37,746	38,211	813	West Germany 11,866; France 8,215.
Unwrought	26,164	22,771	155	Peru 5,816; Poland 3,864; West Germany 3,393.
Semimanufactures	70,549	92,522	479	West Germany 37,430; Belgium-Luxembourg 36,420.
Gallium: Metal including alloys, all forms value, thousands	--	$151	--	United Kingdom $31; West Germany $29.
Germanium: Metal including alloys, all forms do	$197	$202	$70	Belgium-Luxembourg $80; China $51.

See footnotes at end of table.

Table 3.—Netherlands: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Gold:				
Waste and sweepings value, thousands	$2,740	$1,657	--	Belgium-Luxembourg $792; West Germany $782.
Metal including alloys, unwrought and partly wrought thousand troy ounces	957	901	1	United Kingdom 709; France 52.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	6,659	6,160	(2)	Sweden 1,566; Brazil 1,381; Canada 1,172.
Pyrite, roasted	108	522	--	Belgium-Luxembourg 497.
Metal:				
Scrap	236,805	221,641	3,239	West Germany 96,828; United Kingdom 77,044.
Pig iron, cast iron, related materials	43,525	43,276	11	West Germany 8,812; Brazil 8,800.
Ferroalloys:				
Ferrochromium	19,889	16,206	NA	Republic of South Africa 7,284; Albania 6,346.
Ferromanganese	19,565	18,916	--	Norway 9,640; France 5,637.
Ferromolybdenum	126	47	--	Sweden 18; West Germany 16.
Ferronickel	64	103	NA	Dominican Republic 79.
Ferrosilicochromium	99	43	--	All from West Germany.
Ferrosilicomanganese	3,606	7,463	NA	Norway 4,877.
Ferrosilicon	7,884	6,609	NA	West Germany 2,007; Norway 1,986.
Silicon metal	3,306	3,916	--	Republic of South Africa 2,387.
Unspecified	695	1,129	22	France 468; West Germany 289.
Steel, primary forms	282,164	474,922	2	Norway 128,550; West Germany 112,783.
Semimanufactures:				
Bars, rods, angles, shapes, sections	1,134,828	1,023,281	487	Belgium-Luxembourg 366,155; West Germany 306,840; France 127,342.
Universals, plates, sheets	953,646	926,160	116	Belgium-Luxembourg 396,748; West Germany 347,138.
Hoop and strip	185,822	173,083	11	West Germany 100,028; Belgium-Luxembourg 40,851.
Rails and accessories	65,389	58,399	109	West Germany 54,097; France 2,800.
Wire	103,467	102,267	725	West Germany 47,582; Belgium-Luxembourg 40,936.
Tubes, pipes, fittings	736,236	604,142	3,349	West Germany 329,430; France 104,812.
Castings and forgings, rough	23,139	20,372	23	West Germany 12,748; Belgium-Luxembourg 5,541.
Lead:				
Oxides	3,806	2,108	16	West Germany 1,338; Belgium-Luxembourg 451.
Ash and residue containing lead	2,058	2,433	465	West Germany 1,450; Switzerland 143.
Metal including alloys:				
Scrap	11,483	11,614	152	West Germany 6,154; Belgium-Luxembourg 2,522.
Unwrought	41,392	47,060	5,419	Belgium-Luxembourg 14,528; West Germany 9,073; France 8,245.
Semimanufactures	5,642	4,850	14	Belgium-Luxembourg 2,885; West Germany 991; Ireland 903.
Lithium: Oxides and hydroxides	132	278	44	China 200; United Kingdom 25.
Magnesium: Metal including alloys:				
Scrap	783	821	(2)	West Germany 309; United Kingdom 264.
Unwrought	5,441	7,933	7,009	France 402; Norway 266.
Semimanufactures	247	187	--	West Germany 111; United Kingdom 49.
Manganese:				
Ore and concentrate, metallurgical-grade	53,392	67,628	--	Belgium-Luxembourg 7,710; unspecified 57,592.
Oxides	912	631	4	Belgium-Luxembourg 510; West Germany 76.
Metal including alloys, all forms	3,474	4,102	77	Republic of South Africa 2,650; Mozambique 1,137.
Mercury 76-pound flasks	4,553	3,799	87	Turkey 1,073; Hungary 841.
Molybdenum:				
Oxides and hydroxides	83	19	--	West Germany 11.
Metal including alloys:				
Unwrought	87	112	--	West Germany 78; France 32.
Semimanufactures	59	57	1	Belgium-Luxembourg 40; United Kingdom 9.

See footnotes at end of table.

Table 3.—Netherlands: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Nickel:				
Matte and speiss	2,633	3,556	--	Cuba 3,479.
Oxides and hydroxides	1,075	1,245	NA	United Kingdom 190; Sweden 128.
Ash and residue containing nickel	429	754	NA	West Germany 438; Albania 165.
Metal including alloys:				
Scrap	1,377	1,527	265	West Germany 457; Hungary 275.
Unwrought	3,735	3,390	491	Republic of South Africa 826; United Kingdom 621; Zimbabwe 502.
Semimanufactures	1,512	3,133	72	Philippines 2,350; West Germany 372.
Platinum-group metals:				
Waste and sweepings value, thousands	$811	$1,491	--	Belgium-Luxembourg $930; Denmark $240.
Metals including alloys, unwrought and partly wrought troy ounces	51,615	68,048	7,972	West Germany 12,878; Switzerland 12,710.
Rhenium: Metal including alloys, all forms value, thousands	$61	$255	--	West Germany $202; France $23.
Silver:				
Waste and sweepings do	$683	$900	--	Denmark $597; Spain $183.
Metal including alloys, unwrought and partly wrought thousand troy ounces	4,619	4,657	48	France 1,615; West Germany 1,200.
Tin:				
Ore and concentrate	6,053	4,738	--	Zaire 1,320; Burma 1,001.
Oxides	96	99	--	United Kingdom 49; Italy 29.
Ash and residue containing tin	1,861	806	251	France 212; West Germany 123.
Metal including alloys:				
Scrap	242	215	23	West Germany 163; Sweden 15.
Unwrought	6,353	5,022	249	West Germany 1,106; Malaysia 670; Indonesia 515.
Semimanufactures	149	127	6	West Germany 49; United Kingdom 31.
Titanium:				
Ore and concentrate	24,286	22,248	--	Sri Lanka 7,796; Australia 7,592.
Oxides	6,371	6,021	285	West Germany 3,142; United Kingdom 925.
Metal including alloys:				
Scrap	156	93	50	United Kingdom 16.
Unwrought	13	8	3	U.S.S.R. 5.
Semimanufactures	225	70	3	West Germany 23; Japan 20.
Tungsten:				
Ore and concentrate	121	739	1	Australia 167; Burma 143; Thailand 134.
Ash and residue containing tungsten	93	9	NA	NA.
Metal including alloys:				
Scrap	67	58	--	West Germany 22; United Kingdom 20.
Unwrought	262	181	132	Austria 30; West Germany 19.
Semimanufactures	99	68	(2)	Belgium-Luxembourg 49; United Kingdom 13.
Vanadium:				
Ore and concentrate	--	250	--	All from Mozambique.
Oxides and hydroxides	33	321	NA	China 302; West Germany 18.
Ash and residue containing vanadium	308	1	NA	NA.
Zinc:				
Ore and concentrate	348,713	452,439	8,617	Canada 188,176; Ireland 59,790.
Oxides	3,621	3,091	38	West Germany 1,779; France 431.
Blue powder	2,350	3,241	--	Belgium-Luxembourg 2,178; West Germany 863.
Matte	1,536	1,158	NA	West Germany 698; France 190.
Ash and residue containing zinc	12,449	15,243	NA	West Germany 14,384; Cuba 430.
Metal including alloys:				
Scrap	6,398	10,401	6	West Germany 4,784; Belgium-Luxembourg 3,665.
Unwrought	19,710	19,156	(2)	West Germany 8,046; Belgium-Luxembourg 3,394.
Semimanufactures	4,760	4,659	(2)	West Germany 3,029.
Zirconium:				
Ore and concentrate	34,108	23,149	--	Australia 15,470; Republic of South Africa 7,265.
Metal including alloys, scrap	9	166	--	All from France.
Other:				
Ores and concentrates	21,501	19,677	9,021	Canada 4,944; Chile 4,223.
Oxides and hydroxides	22,500	477	--	West Germany 293; Spain 63.
Ashes and residues	62,378	56,507	--	Canada 53,596; West Germany 1,527.

See footnotes at end of table.

Table 3.—Netherlands: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	306,051	257,926	103	West Germany 250,305; Turkey 6,550.
Artificial:				
Corundum	5,743	5,611	105	West Germany 3,899; Czechoslovakia 601.
Silicon carbide	813	851	35	West Germany 600; Belgium-Luxembourg 90.
Dust and powder of precious and semiprecious stones including diamond kilograms	159	205	--	Belgium-Luxembourg 117; Switzerland 40.
Grinding and polishing wheels and stones	2,346	2,263	41	West Germany 1,129; Austria 401.
Asbestos, crude	9,927	5,107	--	Canada 1,750; U.S.S.R. 1,269.
Barite and witherite	98,928	75,748	(2)	China 36,702; Morocco 32,524.
Boron materials:				
Crude natural borates	464,480	394,388	377,052	Turkey 9,326; Belgium-Luxembourg 6,588.
Oxides and acids	2,554	2,275	92	France 715; China 400; U.S.S.R. 397.
Bromine	3,192	3,296	--	Israel 3,250; United Kingdom 39.
Cement thousand tons	2,964	2,568	3	West Germany 1,345; Belgium-Luxembourg 1,203.
Chalk	65,979	80,916	--	France 41,625; West Germany 26,456.
Clays, crude:				
Andalusite, kyanite, sillimanite	1,911	4,024	NA	Republic of South Africa 2,970.
Bentonite	60,382	84,738	43,950	Greece 25,605; West Germany 6,692.
Chamotte earth	25,020	24,036	2,965	West Germany 13,739; France 4,036.
Dinas earth	1,093	2,762	393	West Germany 811; France 846.
Kaolin	403,112	415,497	41,538	West Germany 139,816; United Kingdom 131,351.
Unspecified	723,818	430,222	7,517	West Germany 407,907.
Diamond:				
Gem, not set or strung carats	440,278	492,614	56,753	United Kingdom 132,771; Belgium-Luxembourg 67,513; Ireland 65,878.
Industrial do	493,030	277,335	81,100	Belgium-Luxembourg 70,404; Ireland 52,016; United Kingdom 40,698.
Diatomite and other infusorial earth	16,796	15,275	2,202	Denmark 10,822.
Feldspar, fluorspar, related materials:				
Feldspar	14,860	13,038	--	Norway 8,072; West Germany 2,115.
Fluorspar	20,361	24,168	--	United Kingdom 6,073; West Germany 2,074.
Unspecified	41,123	39,128	--	Canada 22,737; Norway 16,342.
Fertilizer materials:				
Crude, n.e.s	82,227	89,466	--	West Germany 83,660.
Manufactured:				
Ammonia	202,626	47,067	--	Belgium-Luxembourg 2,420; unspecified 43,391.
Nitrogenous	305,594	460,168	--	Belgium-Luxembourg 157,635; West Germany 118,998.
Phosphatic	62,213	77,014	7,761	Belgium-Luxembourg 38,587; Denmark 18,567.
Potassic	381,894	381,114	--	West Germany 106,505; U.S.S.R. 64,953.
Unspecified and mixed	108,193	146,895	9,068	Belgium-Luxembourg 51,035; West Germany 45,719.
Graphite, natural	899	863	--	West Germany 546; China 240.
Gypsum and plaster	461,404	328,377	37	West Germany 166,670; France 134,282.
Iodine	258	206	--	Belgium-Luxembourg 36.
Lime	808,929	589,822	17	Belgium-Luxembourg 331,537; West Germany 257,538.
Magnesium compounds:				
Magnesite	18,114	61,666	252	China 21,530; Greece 15,500.
Oxides and hydroxides	827	1,125	44	West Germany 644; United Kingdom 131.
Other	39,672	--		
Mica: Crude including splittings and waste	3,915	3,985	242	India 1,804; United Kingdom 657.
Nitrates, crude	24,350	20,709	--	Chile 20,107.
Phosphates, crude thousand tons	2,138	1,949	630	Morocco 706; Israel 337; Togo 212.
Phosphorus, elemental	254	95	--	West Germany 90.
Pigments, mineral:				
Natural, crude	530	398	NA	Cyprus 283.
Iron oxides and hydroxides, processed	13,180	12,958	63	West Germany 10,687; France 1,180.
Potassium salts, crude	1,747	2,330	--	France 2,036.
Precious and semiprecious stones other than diamond:				
Natural kilograms	42,844	36,396	19,000	West Germany 10,642.
Synthetic do	4,571	1,911	NA	Japan 1,300; Belgium-Luxembourg 87.

See footnotes at end of table.

Table 3.—Netherlands: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Pyrite, unroasted	164	163	--	West Germany 137.
Quartz crystal, piezoelectric kilograms	68	3	NA	NA.
Salt and brine	66,710	86,813	--	West Germany 49,309; Belgium-Luxembourg 15,881.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	45,323	62,917	(2)	West Germany 24,235; Bulgaria 21,784.
Sulfate, manufactured	20,819	22,417	--	Belgium-Luxembourg 14,265; West Germany 7,775.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	2,488	2,148	--	West Germany 1,255; Finland 649.
Worked do.	43	41	--	Italy 19; West Germany 6.
Dolomite, chiefly refractory-grade do.	784	716	--	Belgium-Luxembourg 466; West Germany 116.
Gravel and crushed rock do.	16,791	16,418	(2)	West Germany 10,818; Belgium-Luxembourg 3,917.
Limestone other than dimension do.	1,079	977	--	Belgium-Luxembourg 966.
Quartz and quartzite do.	39	33	(2)	Norway 12; West Germany 11.
Sand other than metal-bearing do.	6,415	6,020	1	West Germany 5,259; Belgium-Luxembourg 657.
Sulfur:				
Elemental:				
Crude including native and byproduct	456,933	383,418	58,275	West Germany 194,461; Poland 62,826.
Colloidal, precipitated, sublimed	165	328	--	West Germany 180; United Kingdom 126.
Dioxide	5,530	7,638	--	West Germany 7,355; France 282.
Sulfuric acid	247,708	179,448	7	West Germany 153,108; Norway 22,816.
Talc, steatite, soapstone, pyrophyllite	37,771	39,015	233	Norway 12,157; Austria 6,533.
Vermiculite, perlite, chlorite	8,722	5,152	NA	Greece 2,130; West Germany 1,165.
Other:				
Crude thousand tons	1,165	1,453	10	Belgium-Luxembourg 934; West Germany 476.
Slag and dross, not metal-bearing do.	1,355	1,084	--	West Germany 545; Belgium-Luxembourg 513.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,059	4,916	1,320	West Germany 3,477.
Carbon: Carbon black	13,860	15,643	707	West Germany 12,986; United Kingdom 1,048; France 539.
Coal:				
Anthracite thousand tons	419	329	1	United Kingdom 160; West Germany 116.
Bituminous do.	7,530	8,546	4,755	Australia 1,538; West Germany 975.
Lignite including briquets do.	167	144	--	West Germany 143.
Coke and semicoke do.	1,011	420	1	West Germany 255; United Kingdom 105.
Gas, manufactured	189,464	207,844	--	West Germany 51,555; France 30,065.
Gas, natural million cubic feet	116,415	119,445	--	West Germany 119,444.
Peat including briquets and litter	530,249	498,796	--	West Germany 477,901; Finland 13,471.
Petroleum:				
Crude thousand 42-gallon barrels	291,647	278,571	--	United Kingdom 55,801; Iran 53,415; Saudi Arabia 38,232.
Refinery products:				
Liquefied petroleum gas do.	17,849	16,253	1,414	Saudi Arabia 5,160; Algeria 2,147.
Gasoline do.	46,147	45,212	(2)	U.S.S.R. 11,752; Algeria 7,352.
Mineral jelly and wax do.	331	416	4	Austria 131; West Germany 122.
Kerosine and jet fuel do.	2,638	3,620	34	Belgium-Luxembourg 1,724; France 456.
Distillate fuel oil do.	29,676	31,362	(2)	U.S.S.R. 24,659.
Lubricants do.	2,375	2,322	55	Belgium-Luxembourg 726; West Germany 339.
Residual fuel oil do.	41,879	51,918	2	U.S.S.R. 18,392; Spain 5,756.
Bitumen and other residues do.	2,422	1,265	723	Belgium-Luxembourg 251; West Germany 230.
Bituminous mixtures do.	124	66	2	West Germany 34; Belgium-Luxembourg 15.
Petroleum coke do.	3,160	3,088	2,274	West Germany 615; Norway 125.

NA Not available.

[1] Table prepared by Jozef Plachy.

[2] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Indium.—A new indium plant, owned and operated by Billiton International Metals BV, came on-stream in 1983. The plant was expected to produce several tons of indium per year, with a purity of 99.9999%. Much of the capital cost of the new plant was necessitated by adherence to strict environmental regulations.

Iron and Steel.—Almost 95% of the Netherland's crude steel was produced by the oxygen process, and the rest in electric furnaces. Hoogovens IJmuiden BV produced all of the oxygen steel, and Nedstaal BV produced the electric-furnace steel.

Hoogovens ranked as the 25th steel producer in the world, with production of 4.3 million tons. Financial losses, however, despite increased production, were slightly higher at $45 million.

The major part of Hoogovens' restructuring plan was approved by the EEC which entitled the company to $68.4 million of state aid. The Government also granted a $200 million loan to cover a debt of over $175 million that remained after the breakup in 1982 of the joint venture with its partner Hoesch AG from the Federal Republic of Germany. According to the plan, Hoogovens was to cut its annual raw steel capacity to between 5.0 and 3.5 million tons, and hot-rolled product capacity to 3.5 million tons. The company is also to close one of its four hot-strip mills at IJmuiden by 1985 and modernize another strip mill. Hoogovens' total work force was also to be reduced to 16,000 by 1985. The company in 1983 closed its 107,000-ton-capacity wire rod and rebar mill at Utrecht, operated by its subsidiary Demka BV, and transferred bar production to Hoogovens' own bar mill at IJmuiden.

NONMETALS

Dolomite.—Winterswijksche Steen-en Kalkgroeve BV, a subsidiary of Ankersmit Holding BV, was the only company in the Netherlands that produced dolomite. The only quarry, in Winterswijk, produced about 200,000 tons of dolomite limestone for use in the fertilizer industry. Ankersmit also had a dolomite-producing subsidiary in France and Belgium.

Fertilizer Materials.—Except for nitrogen, the Netherlands produced no fertilizer materials. The country, however, had excellent port and storage facilities for mixed materials. There were also several bulk blending plants.

At the close of 1982, Amsterdam Fertilizer BV, a subsidiary of the Israel Chemicals Ltd. Group, purchased a 115,000-ton P_2O_5 triple superphosphate plant in Amsterdam from Unie van Kunstmestfabrieken BV (UKF). The plant was to use phosphate mined in Israel for the manufacture of triple superphosphate in Amsterdam.

Also at the close of 1982, a new fertilizer bulk blending plant was opened at Moerdijk. The plant had facilities to produce about 200 specialized fertilizer mixtures, with a storage capacity of 20,000 tons.

In 1983, construction was underway by Hoechst AG from the Federal Republic of Germany, of a 40,000-ton-capacity ammonia terminal at Vlissingen. Construction resumed after the company agreed to comply with recommendations of the regional environmental directorate.

Two new ammonia plants were also nearing completion in the Netherlands. One was the UKF's 362,000-ton-per-year (nitrogen content) ammonia plant at Geleen, based on natural gas. The plant replaced an existing facility that was based on the more expensive manufactured gas. The other was being built by Nederlandse Stickstoff Maatschappij BV, at Sluiskil, Zeeland, with a capacity of 407,000-per-year (nitrogen content). The new unit is to process ammonium nitrate and calcium ammonium nitrate at a combined capacity of 800,000 tons.

Gypsum.—Large quantities of byproduct gypsum were produced by factories and powerplants that used coal or low-grade, sulfur-containing oil as fuel. Under the Netherlands' environmental legislation, the companies had to desulfurize their waste gases. One of the companies that developed and utilized such a process was Norgips BV in Delzijl. A plant of Norgips', Alpha Mont BV, at Veendam, was built at a cost of about $2.3 million, $1.6 million of which came from the Netherlands Department of Economic Affairs as a grant for technical development. During the summer of 1983, the company also started building a pilot plant at Magnesia International BV's (MAGIN) magnesia plant. The MAGIN plant is to produce alpha-hemahydrate gypsum, a new type of superplaster of unique and favorable properties compared with the more conventional betaplaster. The plant will use 25,000 tons per year of byproduct gypsum from MAGIN's magnesia sinter manufacturing process.

Sand (Silica).—The Netherlands utilized more silica sand than it produced domestically. Most of the sand was imported from neighboring Belgium, whose share was about 72% of total Netherlands imports. The Netherlands was also a significant exporter of processed silica sand.

There were two silica sand producers in the Netherlands in 1983. BV Lieben in the Heerlen area was the leading producer, at 50,000-ton-per-year capacity; the other was Filterzand Wessem BV, which produced sand mostly for filtration. BV Lieben also operated two plants in Belgium. The annual production capacity of the company's three plants amounted to more than 300,000 tons, in addition to about 50,000 tons of silica flour.

MINERAL FUELS

Energy production rose as a result of a Government-approved increase in the output of natural gas, increased exports of natural gas, and production of crude oil from the Continental Shelf, which started in the fall of 1982. Overall, the Netherlands energy supply comprised about 8% nuclear, 3% blast furnace gas, 22% coal, and 67% oil and natural gas.

New legislation introduced by the Government in 1983 provided for the complete restructuring of the electricity supply system by setting up a national production company with local and regional distribution centers. Because of the complexity of the plan and strong opposition by the existing utilities, the Government decided on gradual introduction of the various measures.

There were two nuclear plants, one at Dodewaard with a 50-megawatt capacity, and another at Borselle with a 450-megawatt capacity.

Oil- and gas-drilling activity was at a peak in the North Sea, reaching 45 wells in 1982, compared with 32 in 1981. These resulted in the discovery of five new gasfields and six new oilfields. Another three oilfields and gasfields were found onshore. Total Netherlands' proven and unproven crude oil reserves were estimated at about 555 million barrels, up 50% from that of 1982.

Coal.—A number of coal-burning projects were canceled in 1983 because of escalating construction and environmental costs, and the diminished coal price advantage over oil. These included a new 600-megawatt coal-fired power station at Dordrecht and a 500-megawatt station at Hemweg, near Amsterdam. Three oil- and gas-fired power stations were to be converted to coal, including the 1,050-, 375-, and 225-megawatt plants, at a total cost of almost $700 million. Construction of the $175 million, 25-million-ton-per-year Maasvlakte coal storage terminal near Rotterdam was also rescheduled for completion in 1988.[3]

Natural Gas.—Gas was still the cornerstone of the Netherlands' economy, and the Netherlands remained Western Europe's largest producer and supplier of natural gas in 1983. Natural gas was equal in value to about 17% of the total GNP. About 17% of the gas was obtained from the offshore fields.

The domestic usage and export of natural gas, however, was declining and is expected to decline in the future, as is partially illustrated in table 4.[4]

Table 4.—Netherlands: Sales and exports of natural gas

(Billion cubic feet and billion dollars)

	1979	1980	1981	1982
Domestic sales:				
Household and commercial	893	833	791	720
Industrial	406	388	381	321
Powerplants	254	184	166	226
Total	1,553	1,405	1,338	1,267
Exports:				
Quantity	1,737	1,677	1,511	1,225
Value[1]	$2.68	$3.80	$5.36	$4.32
Grand total:				
Quantity	3,290	3,082	2,849	2,492
Value[1]	$3.92	$5.56	$7.60	[e]$8.00

[e] Estimated.

[1] The value of the Netherland guilder (f.) did not vary significantly between 1979 and 1982, and for the purpose of this table guilders were converted at the average rate of f.2.50=US$1.00.

In addition to its own natural gas, the Netherlands also imported 71 billion cubic feet of gas from Norway. Domestic reserves, however, were thought to be sufficient to last through the 1980's.

The high level of exploration activity in the Netherlands' North Sea sector is expected to produce sufficient reserves to enable this area to supply 20% to 25% of domestic demand by 1986, compared with the 17% supplied at present. In 1983, the Netherlands had 83 onshore and 71 offshore gasfields. The Geological Survey of the Netherlands estimated total gas reserves to be over 81,200 billion cubic feet, which represented less than 2% of the world's total supplies. Proven reserves of the Groningen onshore gasfield were 51,700 billion cubic feet, or almost 65% of the total.

A gasfield was discovered in the North Sea, about 30 miles northwest of Den Helder. During the first tests, the new wells produced 71 million cubic feet of gas per day. Another gasfield close by was brought on-stream by the Mobil Corp. at an initial rate of 50 million cubic feet per day.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary values have been converted from Netherlands guilders (f.) to U.S. dollars at the rate of f.2.85=US$1.00, the average rate for 1983.

[3] Financial Times. The Netherlands. Financial Times Survey. Sec. 3, Nov. 21, 1983, pp. 1-8.

[4] Elseviers Weekblad. Drop in Domestic Use, Export of Natural Gas. Jan. 8, 1983, p. 27.

The Mineral Industry of New Zealand

By Charles L. Kimbell[1]

New Zealand's mineral industry remained only a modest contributor to the national economy; however, expansion and modernization projects relating to the nation's largest and only integrated steel plant, its single oil refinery, and its growing natural gas-natural gas liquids industry provided employment for a considerable number of persons not normally associated directly with the mineral industry.

Notable developments included the initiation of commercial production at the natural gas-based ammonia-urea plant inaugurated in 1982; continued efforts to increase use of domestic natural gas for industry and transport, thereby lessening dependence on imported oil; successful efforts to increase domestic coal production and consumption to the same end; and utilization of the expanded capacity of the country's single aluminum smelter.

PRODUCTION

Positive events related to mineral industry production were (1) gains of output of coal and natural gas in response to Government efforts to increase proportional self-sufficiency in energy materials, (2) growth in aluminum production made possible by completion of another potline in the latter part of 1982, and (3) first-year commercial production from the ammonia-urea plant of Petrochem N.Z. Ltd. On the negative side, there was a reported downturn in cement production, and clear indications that domestic steel production and iron sand output, both for the domestic and the export market, were lower.

Table 1.— New Zealand: Production of mineral comodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[p]
METALS					
Aluminum metal, smelter:					
Primary	154,100	154,740	153,979	166,800	224,900
Secondary	1,500	2,000	3,000	2,700	[e]2,800
Total	155,600	156,740	156,979	169,500	227,700
Gold, mine output, metal content troy ounces	6,998	6,419	6,166	7,775	9,667
Iron and steel:					
Iron ore, gross weight[2]	127	72	197	166	156
Iron sand (titaniferous magnetite):					
Gross weight thousand tons	3,527	3,638	3,253	3,002	2,203
Iron content do	2,011	2,074	1,854	1,711	1,256
Pig iron (sponge iron) do	27	[e]134	150	[e]150	[e]150
Steel, crude do	229	230	221	252	233
Lead, refinery output, secondary	9,000	7,000	7,000	7,000	[e]6,500
Silver, mine output, metal content troy ounces	1,639	747	([3])	([3])	([3])

See footnotes at end of table.

Table 1.— New Zealand: Production of mineral comodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982^{p}	1983^{p}
METALS —Continued					
Tungsten, mine output (scheelite):					
Gross weight	153	8	20	14	11
Tungsten content	85	4	10	7	6
NONMETALS					
Cement, hydraulic thousand tons	^{r}752	^{r}720	759	781	760
Clays:					
Bentonite	4,954	3,000	1,885	6,220	1,958
Kaolin (pottery)	25,590	46,112	49,307	23,957	23,917
For brick and tile	110,021	130,719	132,226	129,924	97,944
Lime^{e}	170,000	170,000	170,000	170,000	165,000
Magnesite	--	--	308	(3)	--
Nitrogen: N content of ammonia	--	--	--	(4)	^{e}43,200
Perlite	2,209	999	999	2,163	1,008
Pumice	25,781	13,463	33,834	50,183	16,799
Salt	55,000	5,500	55,500	70,000	81,000
Sand and gravel:					
Silica sand (glass sand)	136,657	139,899	129,146	160,009	148,357
Other industrial sand	83,400	115,700	363,446	245,349	234,403
For roads and ballast thousand tons	13,189	13,559	13,548	14,154	15,489
For building aggregate do.	4,652	4,286	4,084	4,169	4,359
Stone:					
Dolomite	25,760	5,726	25,112	14,900	17,033
Greenstone	4	3	6	8	(5)
Limestone and marl:					
For agriculture thousand tons	1,613	1,581	1,829	1,592	1,460
For cement do.	1,268	1,389	1,458	1,483	1,497
For other industrial uses do.	289	172	178	184	207
For roads do.	289	229	312	375	274
Serpentine	112,200	80,943	65,714	45,644	64,055
Unspecified:					
Dimension	27,158	16,350	30,791	22,493	22,585
Rock for harbor work thousand tons	2,428	2,246	2,891	2,325	2,254
Sulfur	^{e}650	--	90	156	1,090
MINERAL FUELS AND RELATED MATERIALS					
Carbon dioxide, liquefied	NA	NA	6,066	9,797	NA
Coal:					
Anthracite thousand tons	1	1	1	(5)	^{e}2
Bituminous do.	383	^{r}487	474	428	^{e}510
Subbituminous do.	1,355	^{r}1,467	1,510	1,595	^{e}1,782
Lignite do.	209	^{r}208	212	222	^{e}250
Total do.	^{r}1,948	2,163	2,197	2,245	2,544
Coke:					
Coke oven	30,000	30,000	4,004	2,263	^{e}2,000
Gashouse	35,000	36,000	20,953	7,037	^{e}7,000
Total	65,000	66,000	24,957	9,300	^{e}9,000
Fuel briquets	^{e}15,000	^{e}17,000	6,551	6,144	6,000
Gas, natural:					
Gross^{e} million cubic feet	53,700	43,900	^{r}56,600	^{r}99,300	107,300
Marketed do.	46,172	37,753	48,691	85,375	92,245
Natural gas liquids:					
Liquefied petroleum gas thousand 42-gallon barrels	120	172	248	$^{r\ e}$330	^{e}450
Natural gasoline do.	54	45	44	$^{r\ e}$60	^{e}80
Petroleum:					
Crude do.	3,000	2,635	3,381	5,180	5,247
Refinery products:					
Gasoline do.	10,888	10,294	10,736	9,801	10,667
Distillate fuel oil do.	4,864	4,879	5,058	4,125	4,551
Residual fuel oil do.	5,854	5,235	3,623	2,627	2,298
Other do.	1,106	973	630	483	^{e}590
Refinery fuel and losses do.	490	665	910	735	^{e}794
Total do.	23,202	22,046	20,957	17,771	18,900

^{e}Estimated. ^{p}Preliminary. ^{r}Revised. NA Not available.

[1] Table includes data available through July 16, 1984.

[2] Not used for manufacture of iron; reportedly consumed for gas purification, preparation of stock licks, and manufacture of brick. Because of these uses, iron content is not reported.

[3] Revised to zero.

[4] Although plant reportedly went into operation in 1982, sources now available indicate that output in that year was negligible; therefore, production estimate has been reduced to zero.

[5] Less than 1/2 unit.

TRADE

Trade data for calendar year 1982 did not become available in time for inclusion in this edition. For the most recent data available and for comments on these data, the reader is referred to the 1982 edition of this chapter.

COMMODITY REVIEW

METALS

Aluminum.—Increased production at New Zealand's only aluminum smelter, the Tiwai Point plant of New Zealand Aluminum Smelters Ltd., was possible because of the 1982 completion of a third potline, ahead of schedule and under budget. This expansion raised annual primary aluminum capacity to 245,000 tons, making the facility the largest aluminum smelter in the Southern Hemisphere, and the plant operated at 92% of rated capacity in 1983. Construction of a second aluminum smelter in New Zealand remained in a deferred status.

Gold.—Official annual production returns released in late 1983 indicate that Ryan Mining Ltd. was New Zealand's leading 1982 gold producer, accounting for 27% of national output from its operations in the southern part of South Island. Thames Minerals Ltd.'s Greenstone Valley operations ranked next with about 13% of the total, and Kanieri Gold Dredging Ltd.'s Tara Makau River operations ranked third with 11%. The greatest amount of gold recovered from any single area, however, was the output from a variety of independent producers in the Westland area of the Greymouth Mine Inspectorate, West Coast District of South Island, accounting for 32% of the total national production.

The sharp decline in output by Kanieri's Tara Makau River operation, from 3,385 troy ounces in 1981 to 866 troy ounces in 1982, was the result of the termination of dredging on that stream early in 1982. The firm planned to continue operations at Ngahere on the Grey River, where it had built a new dredge hull that was to be equipped with some machinery salvaged from the 26-year old Tara Makau dredge, together with some new machinery. However, in early 1983, construction of the new dredge was at a standstill pending changes in the company's financial structure.

L&M Mining Ltd. reported gold sales valued at over $820,000[2] for 1983, and indicated that it would add a second dredge before mid-1983. Company operations are in central Otago.

Although the overwhelming majority of New Zealand's present meager gold production is derived from placer operations, there were indications of interest in reopening some lode gold mines. Properties under examination included the Martha Hill Mine at Waihi and the nearby Karangahake Mine at Paetoa, both on North Island's east coast, and the Monowai Mine, some 70 kilometers from Martha Hill. Reserves delineated at these properties were reported as follows: Martha Hill, 14.6 million tons of ore grading 3.2 grams of gold per ton and 32 grams of silver per ton, plus low-grade material totaling 8 to 10 million tons grading 0.5 to 2.0 grams of gold per ton; Karangahake, 700,000 tons of ore grading 15 grams of gold per ton and 50 grams of silver per ton; and Monowai Mine, 197,000 tons of ore grading 9.5 grams of gold per ton and 41 grams of silver per ton.

Iron Sands and Iron Ore.—Titaniferous magnetite sands mined by two companies from deposits along the southwest coast of North Island remained New Zealand's leading and only significant nonfuel mineral product from an international viewpoint. From an economic viewpoint within New Zealand, the value of iron sand production was second to that of stone and sand and gravel for roads, railroads, and construction.

Total iron sand output declined sharply, but shipments were up slightly as withdrawals from stocks totaled over 497,000 tons. Exports, chiefly to Japan, increased by about 100,000 tons, and local sales fell by over 20,000 tons. Waipipi Ironsands Ltd.'s Waverley deposit, with a 1983 output of 592,525 tons, and New Zealand Steel Mining Ltd.'s Taharoa deposit, with an output of 1,396,290 tons, were operated to meet export demand; the latter firm's Waikato North Head Mine was exploited to supply 214,409 tons of ore to meet domestic requirements of the Glenbrook steel plant.

The miniscule quantity of regular iron ore mined in New Zealand, entirely derived from the Onekaka deposit of Golden Bay Dolomite Ltd., was used wholly for nonmetallic applications, including gas purification, preparation of stock licks, and brick manufacture.

Iron and Steel.—New Zealand Steel Ltd., the nation's principal steel producer, indicated that for the year ending March 31, 1983, there was a 17% increase in net profit to about $15 million, on a record-high turnover of $197 million. A slump in domestic demand at midyear was offset by increased export sales, with the result that the value of billet exports exceeded domestic sales for the first time. Expansion of the Glenbrook plant was reportedly well ahead of schedule in September, and completion of the project's first stage was targeted at yearend 1984, raising annual capacity to 350,000 tons. However, in December 1983, it was reported that delivery of some equipment was behind schedule, and that commissioning of new sponge iron capacity would be delayed until the first quarter of 1985, and of the corresponding steel capacity until the second quarter. The expansion project's first stage reportedly includes four reduction kilns, two electric pig iron furnaces, a Q-Bop converter, and continuous-slab and billet casters.

It was also reported that by early 1984, site preparation for the second stage of the plant expansion, aimed at raising annual rolling capacity of 550,000 to 750,000 tons would be completed, with commissioning of the hot and cold mills expected in late 1986. Company officials claim that completion of the second stage will enable the firm to meet 80% of New Zealand's demand for flat products.

New Zealand's second steel plant, that of Pacific Steel Ltd., continued to use scrap supplemented by billets purchased from New Zealand Steel, to produce wire rods, reinforcing bars, flat bars, angles, and channels.

Vanadium Slag.—The Chairman of Directors of New Zealand Steel indicated that with the completion of the first stage expansion of the firm's Glenbrook Works in 1984, the firm will have the capability of producing byproduct vanadium-rich slag, and that production of this material should make a "valuable contribution to the company's result."

NONMETALS

Cement and Lime.—New Zealand's cement industry experienced difficulties in 1983 as demand fell somewhat in the last half of the year, and profits declined as a result of reduced sales and the Government-imposed price freeze. New Zealand Cement Holdings Ltd. reportedly suspended work on its Oamar Cement Works project, which would add significantly to the firm's capacity in its Westport and Burnside Works. The expansion of McDonalds Lime Ltd.'s lime works was continued; this plant's second kiln now under construction is scheduled to provide extra capacity to meet lime demand at the Glenbrook steel mill. The new kiln is budgeted to cost $3 million.

Fertilizer Materials.—There has been a continuing decline in sales of fertilizer materials in New Zealand for the past 5 years, as shown in table 2.

Table 2.—New Zealand: Consumption and sales of fertilizer materials

(Thousand metric tons)

Year[1]	Raw materials consumption at fertilizer works	Sales of fertilizers		
		Manufactured	Crude	Total
1979	1,921	2,418	103	2,521
1980	1,968	2,376	96	2,472
1981	1,656	1,977	74	2,051
1982	1,550	1,941	86	2,027
1983	1,342	1,652	148	1,800

[1] Data are for years ending June 30 of that stated.

Source: Ministry of Agriculture and Fisheries. New Zealand Fertilizer Statistics 1982. Pp. 15, 30-31; and New Zealand Fertilizer Statistics 1983. Pp. 15, 30-31.

Materials included in table 2 include all types of soil nutrients and conditioners, not only the standard crude fertilizers such as phosphate rock, potassium chloride, and potassium and ammonium sulfate, but also lime, serpentine rock, urea, sulfur, and a host of minor chemical additives as well as products made from these materials. It should further be noted that despite this decline in fertilizer raw material consumption and in sales of products, there has been an almost continual, although very modest increase in the area of land under cultivation across the same time period. The resulting decline in use of fertilizer materials on a ton-per-unit-area basis was attributed by the Ministry of Agriculture and Fisheries to increased fertilizer prices and declining real farm income. The Ministry also noted that most New Zealand soils need fertilizers, particularly phosphates, but that the quantity of fertilizer actually applied in any year is influenced more by financial considerations of the farmers than by technical requirements.

Nitrogen.—Although the ammonia-urea plant of Petrochem was completed in 1982, its output in that year was negligible, and production in 1983 at this, New Zealand's only ammonia-urea plant, was at only 28% of the annual capacity of 155,000 tons.

MINERAL FUELS

Coal.—Growth in internal demand stimulated both public and private sector producers to increase output significantly. In 1983, state mines accounted for 68% of output, compared with 63% in 1982.

The New Zealand Ministry of Energy's Mines Division released a study entitled "New Zealand Coal Reserves—1983" that revised previously reported reserves upward substantially. Recoverable reserves reported are summarized as follows, in million metric tons:

Type of coal	Measured	Indicated	Inferred	Total
Bituminous	35.8	30.7	91.7	158.2
Subbituminous	207.7	319.0	194.7	721.4
Lignite	52.6	5,411.7	54.8	5,519.1
Total	296.1	5,761.4	341.2	6,398.7

Of the total reserve, 620.5 million tons, all subbituminous, is in North Island; the remaining subbituminous, bituminous, and lignite deposits are in South Island.

In mid-1983, a $1.7 million contract was awarded for a feasibility study for the development of a 500,000-ton-per-year open pit mine at Ohinewai, near Huntley, North Island. The contract was given to a consortium headed by Rheinbraun Consulting, of the Federal Republic of Germany. The deposit reportedly has reserves of 25 million tons. In December, it was announced that the Ministry of Energy would fund a series of feasibility and environmental studies by the Waikato Valley Authority relating to the possibility of opening such a mine, with these studies scheduled to continue through 1984.

The Ohinewai project is but one element of an overall coal production expansion scheme projected for the Waikato Basin over the next decade, that in total could involve the expenditure of over $560 million to boost the region's output from 900,000 tons to 3 million tons by 1990 and 4 million tons in 1997.

Natural Gas.—The continued increase in natural gas production reflected the Government's desire to increase energy self-sufficiency to the maximum practical level as rapidly as possible. To increase natural gas consumption as a substitute for traditional fuels, it has been necessary to expand the gas transmission line network. A major step by New Zealand standards in this direction has been the project to link Westfield, now essentially the northern terminus of the natural gas system, from the Kaponi and Maui Fields far to the south with Whangarei, some 162 kilometers to the north. This line, 8 inches in diameter from Westfield through Auckland and 6 inches in diameter beyond that point, follows the route of the oil products line, for 146 kilometers sharing a trench with that line. The gas will flow from south to north; the oil products, from north to south.

The price freeze imposed by the Government had an adverse effect upon the natural gas industry. Auckland Gas Co. Ltd. recorded a 19% increase in natural gas sales in its fiscal year ending June 30, 1983, but pretax profit advanced only slightly over 4% in the same period.

To maximize use of natural gas, a program to convert motor vehicles on North Island to use compressed natural gas as fuel has resulted in the adaption of nearly 17,500 vehicles by June 30, 1983. Conversions were averaging 1,800 per month in the last half of 1982, and although the monthly number declined after that, the rate of conversions was still adequate to achieve the goal of 200,000 vehicles by the end of 1990. This conversion scheme receives Government assistance in two forms: (1) From January 1, 1983, low interest loans to meet the full cost of conversion were made available, and (2) motorists converting to compressed natural gas were given vouchers worth $300 by the compressed natural gas industry.

A decision to increase availability of liquefied petroleum gas (LPG) on South Island was made late in the year, and to this end, it was announced that a special LPG tanker, *Tarihoko,* would be placed in service in 1984. South Island demand for LPG increased from 12,000 barrels in 1980 to 27,000 barrels in 1983, and an increase to over 115,000 barrels annually is anticipated in the first year that the vessel is in service. It was reported that over 6,700 vehicles on South Island were powered by LPG.

Endowed with reserves of natural gas disproportionately large to those of crude oil in comparison to many other nations, New Zealand's Government has placed considerable emphasis on maximizing development of natural gas and particularly of a natural gas liquids extraction program aimed at domestic markets.

Petroleum.—In October, it was reported that both the McKee and Pouri Oilfields would pay back exploratory and development costs within 1 year by oil sales. At the end of that year, the McKee Field was expected to be producing 1,200 barrels per day from each of its three wells and the Pouri Field would provide an additional 1,200 barrels per day; such a production level is equal to 6% of New Zealand's oil consumption, with a value of about $77 million per year. Recoverable reserves at McKee Field have been variously estimated between 6 million and 11 million barrels. Although production from these fields, coupled with condensate output from the country's gasfields, falls far short of meeting New Zealand's crude liquid fuel requirements, every barrel produced indigenously contributes to saving foreign exchange.

Expansion of the country's only oil refinery, New Zealand Refining Co. Ltd.'s Marsden Point plant near Whangarei, continued with completion rescheduled for mid-1985. This expansion project, which is to raise throughput capacity to about 70,000 barrels per day (not 700,000 barrels per day as erroneously published in the 1982 edition of this chapter), will provide the refinery with the capability of using a wider variety of crude feedstock and the ability to produce a more diverse range of products. The expansion project, one of the largest construction jobs ever undertaken in New Zealand, requires about 2,500 on-site workers, not to mention thousands elsewhere in New Zealand and abroad, manufacturing the necessary equipment. The $900 million main contract for the project was awarded in late 1981 to Badger-Chiyoda Joint Venture.

In connection with the refinery expansion, a 10-inch, 162-kilometer products pipeline linking the refinery with the Wiri storage depot at Auckland has been undertaken. This line over much of its length will be buried in the same trench with a gas pipeline that will carry gas north to the Whangarei area.

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[1] Senior foreign mineral specialist, Division of Foreign Data.

[2] Where necessary, values have been converted from New Zealand dollars ($NZ) to U.S. dollars at the rate of $NZ1.495=US$1.00.

The Mineral Industry of Nigeria

By Ben A. Kornhauser[1]

The 22% drop in Nigeria's crude oil revenues in 1983 sharply reduced its foreign exchange reserves available for imports needed to keep the economy growing. The country's economy was based on oil, which accounted for more than 90% of its export earnings.

Royal Dutch/Shell was chosen to develop a liquefied natural gas (LNG) project for export to Europe. The reduced LNG program appeared likely to succeed; it could be a major contributor to Nigeria's economy when completed, and it would eliminate most of the wasteful gas flaring. The Nigerian National Petroleum Corp. (NNPC), the majority owner, and Shell were the only equity owners of the project. Natural gas also was to be the feedstock for a fertilizer complex that was being built near Port Harcourt.

Although all five of Nigeria's steel rolling mills had been commissioned and had the capability of rolling 1.4 million tons of steel per year, the Delta Steel Co. complex produced only 140,000 tons of steel in 1983. The billets for those rolling mills were to be supplied by Delta until the steel and blast furnaces of the Ajaokuta steel plant were in operation. Delta's reduced capacity utilization was due mainly to its erratic power supply.

PRODUCTION AND TRADE

Nigeria's economy remained severely strained owing to the world oil glut and the Organization of Petroleum Exporting Countries (OPEC) limiting production quotas for Nigeria. The country's economic health depended primarily on crude oil, which accounted for more than 90% of its export earnings, 83% of Government revenue, and had a value equal to about 25% of the gross domestic product (GDP). Revenue from other mineral production was approximately 2% of oil revenue. The decrease in oil income, resulting from the drop in oil output and price, greatly contracted economic activity since mid-1981. The reduced income created a shortfall in foreign reserves for needed imports and increased arrears in trade payments. The economic recession caused the Government to slow or to stop most major projects that were planned to provide a more diversified economy.

Nigeria's GDP was about $36.3 billion[2] in 1983, down 4.4% from that of 1982. Foreign debt was estimated between $12 to $15 billion. The United States, which had Nigeria's largest deficit of $2,880 million, decreased that deficit slightly in 1983. Oil production in 1983 averaged 1.238 million barrels per day, just below the 1.3 million barrels per day allotted by OPEC. Of this production, exports averaged 1.059 million barrels per day and represented 86% of production with the balance consumed domestically. Owing to the decline in export and the reduced price for Bonny light crude oil, which sold for $30 per barrel in 1983, Nigeria's estimated oil income amounted to only $10.2 billion compared with $13.1 billion in 1982. Domestic crude oil consumption included the oil used in domestic refining and crude processed abroad for domestic use, and probably some oil in excess of the OPEC quota.

Nigerian imports of $5.26 billion dropped approximately 30% from that of 1982. Nigeria imported $1.11 billion from the United

Kingdom, its largest trading partner, and only $856 million (16% of imports) from the United States, its second largest trading partner. Imports from the United States were 33% less than that of 1982. Oil continued to be Nigeria's main export with the United States remaining as the largest single purchaser of its crude oil. However, Nigeria's oil trade continued to shift toward Europe. Of Nigeria's crude oil exports, the four largest importers received 66.7% of the total and were the United States, 22.3%; France, 20.8%; Italy, 12.6%; and the Federal Republic of Germany, 11%.

Production of tin metal and columbite fell approximately 10% and 40%, respectively, from 1982 output. The increase of 40% in steel production over that of 1982, although numerically large, was a great disappointment since the industry's production capacity was 1 million tons of steel. Production in the other commodities remained relatively unchanged from that of 1982.

Nigeria's trade with the United States decreased considerably in 1983, dropping 45% in exports and 33% in imports.

Table 1.—Nigeria: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
METALS					
Columbium and tantalum concentrates, gross weight:					
Columbite	567	554	377	180	110
Tantalite	1	1	2	1	1
Iron and steel: Steel, crude	15,000	15,000	15,000	100,000	140,000
Lead:					
Mine output, metal content[e]	70	366	204	260	260
Metal, refined, secondary	1,500	2,000	2,000	2,000	2,000
Tin:					
Mine output, cassiterite concentrate:					
Gross weight	3,824	3,543	3,172	[r] [e]2,355	2,130
Sn content	2,750	2,569	2,300	1,708	1,544
Metal, smelter	2,858	2,678	2,485	[e]1,800	1,620
Zinc ore and concentrate, metal content	--	--	[e]100	100	100
NONMETALS					
Cement, hydraulic thousand tons	1,740	[r]2,400	2,700	3,600	3,600
Clays:					
Kaolin	670	671	635	700	700
Unspecified	NA	56,973	39,835	20,900	20,000
Feldspar[e]	5,000	5,000	5,000	5,000	5,000
Stone:					
Limestone thousand tons	2,006	2,336	1,535	[r] [e]1,400	1,400
Marble	1,031	368	3,735	3,300	3,000
Shale thousand tcns	149	158	140	140	140
MINERAL FUELS AND RELATED MATERIALS					
Coal do	172	176	116	NA	NA
Gas, natural:					
Gross million cubic feet	[e]820,000	[e]750,000	700,000	685,000	655,000
Marketed do	[e]18,100	[e]19,000	19,000	19,000	18,000
Petroleum:					
Crude thousand 42-gallon barrels	840,000	753,000	525,000	472,000	452,000
Refinery products:					
Gasoline do	8,395	[e]10,600			
Jet fuel do	160	[e]200			
Kerosine do	4,585	[e]5,800			
Distillate fuel oil do	8,760	[e]11,000	NA	NA	NA
Residual fuel oil do	10,220	[e]12,800			
Other, unspecified do	730	[e]900			
Refinery fuel and losses do	1,460	[e]1,800			
Total do	34,310	[e]43,100	NA	NA	NA

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

COMMODITY REVIEW

METALS

Columbium and Tantalum.—With the increased availability of columbium oxide from foreign pyrochlore sources, the importance of Nigerian columbite production continued to decline as a source of columbium. The columbite concentrate production, which was contained in the output from the Amalgamated Tin Mines of Nigeria (Holdings) Ltd. and from Bisichi-Jantar Nigeria Ltd., fell about 40% from that of 1982.

Iron and Steel.—By yearend 1983, all five of the Nigerian rolling mills had been commissioned and were to be supplied by steel from the Delta steel complex at Warri, which initially had the annual capacity to produce 960,000 tons of billets and to roll 320,000 tons. Each of the rolling mills at Jos, Oshogbo, and Katsina had the initial capacity to roll 210,000 tons per year. The first light section rolling mill at the Ajaokuta steel plant had the capacity to roll 400,000 tons per year. These mills rolled products for the construction industry such as reinforcing bar (rebar), wire, angle irons, channels, light sections, flat strip, and I-beams. The integrated steel mill complex at Ajaokuta was being constructed through backward integration, that is, the rolling mills were being built first, then the raw steel plant, finally, the blast furnaces to produce the pig iron.

Owing to erratic power supply and power failures, only 140,000 tons of steel were produced in 1983. To rectify the problem, a contract for a separate 456-megawatt powerplant was let to Brown Boverie & Cie. in Mannheim but had not been executed by yearend because of Nigeria's economic difficulties. Other problems included poor transportation infrastructure to the four rolling mills, misfit between Delta's billet size and Ajaokuta's rolling mill, and the need for a power substation (under construction) to supply the energy needs of Ajaokuta. Hamburger Stahlwerke AG of the Federal Republic of Germany was selected to provide technical assistance in operating Delta's direct-reduction plant more efficiently. By yearend, Nigeria's economic difficulties and increased construction costs practically stopped construction at Ajaokuta.

Tin.—The Government was considering a plan to merge the country's five major tin producers into a new holding company, the Nigerian Tin Mining Co. (NTMC), in order to revive the industry. The Government-owned Nigerian Mining Corp. would own 60% of NTMC. Implementation of the merger appeared doubtful owing to factors such as opposition by the involved tin companies, Nigeria's low tin export quota, and large investments needed for the development of deep mines since the easily minable alluvial deposits were depleted.

NONMETALS

Fertilizers.—A fertilizer complex that would use natural gas feedstock was being built in Onne River State, near Port Harcourt, to supply 60% of Nigeria's fertilizer requirements. The plant, situated on the Okrika Creek to permit water transport to major distribution centers, would be operated by the National Fertilizer Co. of Nigeria. The complex was to include a 1,000-ton-per-day ammonia plant designed by the managing constructor M. W. Kellogg Co., a 1,500-ton-per-day urea plant, and a 1,000-ton-per-day mixed fertilizer plant.[3]

MINERAL FUELS

Natural Gas.—In December 1983, the Nigerian Government selected Royal Dutch/-Shell as the leader in a project to export LNG to Europe. One billion cubic feet of gas per day was expected to be shipped in specially built tankers. The equity owners of the project were to be Shell and NNPC, with NNPC as the majority owner. The cost of the project was estimated at $6.6 billion with financing as follows: $4 billion in supplier's credits, $1.35 to $1.75 billion in capital from the two equity owners, and $1 billion from a syndicated European loan. The tentative completion date was in the early 1990's. The critical issue was where and at what price the daily gas output could be sold. Previously, Bonny LNG Ltd. was abandoned for many reasons, including its estimated $14 billion cost, the dissolution of the original venture by its participants, and falling gas prices.

Shell was chosen as the project leader because of factors such as its expertise with LNG, its position as the largest oil operator in the country, and its good contacts with the most likely European buyers of the LNG. Even with the military takeover at yearend 1983, the project had a favorable prognosis since the new head of Government had favored LNG previously, and other major capital projects by the Government had been scrapped with the slump in oil revenues. The LNG plant would reduce the gas flaring, which at peak oil production of 2.1 million barrels per day produced around 3 billion cubic feet per day of associated gas. Of that amount, about 200 million cubic feet were consumed by the local economy, and the balance was flared.

In 1982, the NNPC granted Saipem S.p.A. (the lead company) and Snamprogetti S.p.A. a contract for the Escravos-Lagos gas pipeline, a 236-mile, 36-inch gas pipeline from the Warri Gasfield to a new powerplant under construction by the National Electric Power Authority at Egbin near Lagos. Pipeline construction was to start in January 1983 with estimated completion by October 1985.[4]

Petroleum.—The NNPC found oil offshore Cross River State with its Okono-1 well, which flowed 2,500 barrels per day of light gravity oil of 42° API. The strike was reported at a depth of 2,825 meters below sea level. NNPC had drilled a total of 25 successfull wells of which 20 were offshore. Azienda Generali Italiana Petroli S.p.A. (AGIP) confirmed the development of its small Beniboye offshore field for mid-1984 startup. Production was expected to be 10,000 to 12,000 barrels per day. AGIP also was evaluating the Agbara Field with a third well.[5] Marathon Oil, now owned by the United States Steel Corp., sold the 40% interest of its Pan Ocean subsidiary in the Pan Ocean-NNPC venture to Impex, an Anguilla-based company. Pan Ocean-NNPC production had declined to about 5,000 barrels per day.[6]

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Nigerian naira (₦) to U.S. dollars at the rate of ₦1.00=US$1.35, as of Sept. 1983.

Engineering and Mining Journal. Feb. 1983, p. 64.

[3] Industrial Minerals (London). No. 189, June 1983, p. 91.

———. No. 194, Nov. 1983, p. 63.

[4] Oil and Gas Journal. V. 81, No. 46, Nov. 14, 1983, p. 100.

[5] Petroleum Economist. V. 50, No. 10, Oct. 1983, p. 400.

[6] ———. V. 50, No. 4, Apr. 1983, p. 148.

The Mineral Industry of Norway

By Joseph B. Huvos[1]

In 1983, Norway remained one of the world's major producers of aluminum, magnesium, and ferroalloys because of its sizable hydroelectric resources. Development of North Sea oil has made the country Western Europe's second largest oil producer and one of the largest natural gas producers. Norway's most important mineral products and approximate percentages of world output were ilmenite, 18%; magnesium, 14%; aluminum, 5%; cobalt, 5%; and nickel, 4%. Production of other metals, minerals, and fuels important to the national economy included copper, pig iron, steel, lead, zinc, vanadium, cement, feldspar, fertilizer materials, nepheline syenite, quartzite, sulfuric acid, coal, and peat.

Economic activity including manufacturing was still lagging; however, exports grew as market prices for major products such as petroleum and aluminum increased with the exchange rate of U.S. dollars.

As reported, investments in the offshore petroleum sector represented the most dynamic spending element during the year. Total investment in this sector was about $3 billion,[2] an increase of 63%. In the metals industry investments fell by about 60%.

Norway's gross national product was about $61 billion, 0.25% higher in real terms than that of 1982. Oil, gas, and coal contributed about $10 billion, iron and steel contributed $500 million, and nonferrous metals contributed $200 million.

There were a number of significant developments during 1983. Year-round drilling activities started on the Continental Shelf north of the 62° parallel. Titania A/S certified its new titanium ore pelletizing plant for startup. The Government's A/S Norsk Jernverk iron and steelmaker applied to the Government for refinancing. Elkem A/S decided to phase out its Skorovas Mine in 1984. The company's Sulitjelma Mine reverted to the state.

PRODUCTION

There was an unexpected increase in the production of North Sea oil compensating for a decrease in Ekofisk and Frigg Fields natural gas.

Table 1.—Production indexes, metal and mineral sector

(1975 = 100)

	1982	1983^{p}
Oil, mining, energy, total	131	138
Oil and mining	381	435
Coal	56	62
Crude oil and natural gas	458	526
Ore mining	83	90
Oil refining	65	66
Ceramics and glass	107	105
Mineral products	83	80
Iron, steel, ferroalloys	65	70
Nonferrous metals	93	103

^{p}Preliminary.

Source: Monthly Bulletin of Statistics of Norway. V. 102, 1984, pp. 16-19.

Table 2.—Norway: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983^{p}
METALS					
Aluminum metal:					
Primary ingot	663,916	653,337	^{r}633,585	636,091	710,637
Secondary ingot	3,500	4,500	4,000	4,000	4,000
Cadmium metal, smelter	115	130	117	104	117
Cobalt metal	953	1,275	1,444	992	903
Copper:					
Mine output, metal content of concentrate	28,016	28,869	28,238	27,942	26,200
Metal:					
Smelter, primary only (includes electrowon)	27,339	33,690	31,952	24,388	27,172
Refined:					
Primary (electrowon)	20,964	25,785	26,077	18,041	22,705
Secondary	6,000	6,000	6,000	6,000	6,000
Total	26,964	31,785	32,077	^{e}24,041	28,705
Iron and steel:					
Iron ore and concentrate thousand tons	4,066	3,884	4,064	3,266	3,535
Metal content of ore do.	2,643	2,473	2,684	2,123	2,227
Roasted pyrite do.	^{e}110	150	^{e}150	^{e}150	415
Pig iron do.	650	612	568	483	565
Ferroalloys:					
Ferrochrome	11,512	11,305	^{r}11,437	12,000	^{e}8,000
Ferrochromium silicon	717	424	985	1,000	^{e}900
Ferromanganese	337,884	^{r}295,706	^{r}233,390	203,256	224,032
Ferrosilicon (75% basis)	^{r}337,008	^{r}319,983	^{r}313,763	296,071	345,846
Silicon metal	70,000	85,000	^{r}55,000	55,000	55,000
Ferrosilicomanganese	184,415	^{r}167,490	^{r}214,534	215,732	180,905
Other	29,674	^{r}19,795	^{r}4,530	12,000	15,317
Total	^{r}971,210	^{r}899,703	^{r}833,639	795,059	830,000
Steel, crude thousand tons	923	854	848	768	831
Semimanufactures:					
Rolled do.	741	^{e}750	^{e}740	^{e}740	^{e}740
Finished castings do.	6	^{e}10	^{e}6	^{e}6	^{e}6
Lead:					
Mine output, metal content	3,596	2,600	^{e}3,600	^{e}3,700	^{e}4,100
Smelter, secondary only	400	^{e}400	--	--	--
Magnesium metal, primary	44,177	44,352	47,602	^{e}35,000	29,895
Nickel:					
Concentrate, metal content	^{e}500	2,000	7,000	3,500	3,600
Metal, primary	30,686	37,123	37,095	25,644	28,309
Platinum-group metals[2] troy ounces	37,327	NA	NA	NA	NA
Titanium: Ilmenite concentrate	819,815	827,814	657,625	551,764	544,238
Vanadium, mine output, metal content^{e}	570	540	570	300	300
Zinc:					
Mine output, metal content	29,592	28,670	^{e}29,800	^{e}31,900	^{e}32,300
Metal, primary	77,763	79,416	80,279	78,734	90,642
NONMETALS					
Cement, hydraulic thousand tons	2,197	2,093	1,789	1,705	1,617
Feldspar, lump[3]	87,888	67,559	^{e}70,000	^{e}70,000	74,000

See footnotes at end of table.

Table 2.—Norway: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983^{p}
NONMETALS —Continued					
Graphite	11,892	10,406	8,665	7,451	8,060
Lime, hydrated, and quicklime	^{e}130,000	130,000	^{e}130,000	^{e}130,000	^{e}130,000
Nitrogen: N content of ammonia	544,532	515,078	544,793	520,411	512,800
Olivine sand	791,988	1,102,739	1,280,000	1,120,000	1,186,000
Pyrites and pyrrhotite, gross weight	240,553	421,367	412,578	423,020	415,105
Sodium and potassium compounds, n.e.s.:					
Caustic soda	176,019	183,554	184,481	182,765	205,581
Sodium carbonate^{e}	27,000	27,000	27,000	27,000	27,000
Stone:					
Dimension stone: Slate	50,000	50,625	NA	NA	NA
Crushed and broken:					
Dolomite:					
Ground	97,111	116,944	NA	NA	NA
Not further described	513,350	559,117	NA	NA	NA
Limestone thousand tons	5,254	4,146	NA	NA	NA
Nepheline syenite	241,131	231,339	223,152	^{e}220,000	226,995
Quartz and quartzite	639,487	843,762	NA	NA	NA
Sulfur:					
Pyrites, S content thousand tons	119	193	210	216	^{e}220
Byproduct of:					
Metallurgy do	40	^{e}40	^{e}40	^{e}40	^{e}40
Petroleum do	6	^{e}6	^{e}6	^{e}6	^{e}10
Total do	165	239	^{e}256	^{e}262	^{e}270
Sulfuric acid (100%)	386	359	NA	NA	NA
Talc, soapstone, steatite:					
Unground	34,294	35,270	33,258	^{e}33,000	^{e}35,000
Other	53,191	52,365	^{e}52,000	^{e}52,000	^{e}52,000
Total	87,485	87,635	^{r} ^{e}85,258	^{e}85,000	^{e}87,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, all grades	280,280	288,412	312,754	335,511	477,795
Coke, all grades	336,541	343,941	340,817	332,531	503,391
Gas:					
Manufactured million cubic feet	563	458	410	284	170
Natural:					
Gross^{e} do	790,000	960,000	958,000	[4]932,838	[4]931,561
Marketed do	759,482	922,065	919,859	896,950	904,428
Peat:^{e}					
For agricultural use	60,000	60,000	60,000	60,000	60,000
For fuel use	1,200	1,200	1,200	1,200	1,200
Petroleum:					
Crude thousand 42-gallon barrels	140,111	181,692	175,361	183,010	214,435
Refinery products:					
Gasoline, motor do	10,318	9,941	10,060	10,234	10,005
Jet fuel do	1,956	1,321	4,190	3,613	5,321
Kerosine do	3,663	3,548	3,670	3,131	3,181
Distillate fuel oil do	27,534	25,966	26,051	26,026	26,413
Residual fuel oil do	14,601	11,876	8,689	7,973	7,349
Lubricants do	30	31	NA	NA	NA
Other do	6,381	6,545	1,022	1,479	2,118
Refinery fuel and losses do	5,013	3,342	^{e}2,684	2,623	2,720
Total do	69,496	62,570	56,366	55,079	57,107

^{e}Estimated. ^{p}Preliminary. ^{r}Revised. NA Not available.

[1] Table includes data available through June 28, 1984.

[2] Data represent exports, presented instead of actual production data, which are reported in official sources as not available for publication. A part of these exports may be derived from imported materials.

[3] Excludes nepheline syenite, which is included under "Stone."

[4] Reported figure.

TRADE

An increase in offshore production and the higher dollar exchange rate raised export value of oil by about $1 billion, to about $12 billion. The United States was Norway's fourth largest supplier with a share of $1.4 billion, or about 10% of total Norwegian imports in 1982, of which coal accounted for more than $40 million. Oil-drilling equipment also accounted for a significant portion of the total. In August 1984, the U.S. Government was to again formally participate in the "Offshore Northern Seas" trade show in Stavanger, offering for sale oil industry equipment and know-how.

Table 3.—Norway: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	611,231	637,278	7,230	West Germany 179,804; United Kingdom 102,698.
Cadmium: Metal including alloys, all forms	94	139	NA	NA.
Cobalt: Metal including alloys, all forms	1,638	1,007	NA	NA.
Copper:				
Ore and concentrate	97,387	92,712	--	West Germany 37,078; Finland 29,711; Sweden 24,265.
Metal including alloys, all forms	39,973	32,592	1,463	West Germany 15,135; France 3,205.
Gold:				
Waste and sweepings value, thousands	$1,636	$1,252	NA	United Kingdom $886; West Germany $154.
Metal including alloys, unwrought and partly wrought troy ounces	14,822	12,603	NA	West Germany 9,581; Sweden 1,125; Italy 966.
Iron and steel:				
Iron ore and concentrate including roasted pyrite thousand tons	3,666	2,334	--	West Germany 948; United Kingdom 678.
Metal:				
Scrap	32,536	32,569	65	Sweden 12,181; West Germany 11,027.
Pig iron, cast iron, related materials	70,592	64,629	--	United Kingdom 34,229; Denmark 14,943.
Ferroalloys	[r]738,402	727,152	6,934	West Germany 212,055; United Kingdom 80,135.
Steel, primary forms	227,676	192,791	1,039	Netherlands 94,566; United Kingdom 25,798.
Semimanufactures	453,766	392,654	1,437	Sweden 103,698; United Kingdom 96,913.
Lead:				
Ore and concentrate	5,161	7,449	--	All to West Germany.
Metal including alloys, all forms	8,052	6,536	--	Denmark 4,278; Sweden 1,456.
Magnesium: Metal including alloys, all forms	138	137	--	West Germany 111.
Manganese:				
Ore and concentrate, metallurgical-grade	2,561	5	--	All to Sweden.
Metal including alloys, all forms	282	4	NA	NA.
Mercury 76-pound flasks	2,002	3,858	--	Spain 3,393; West Germany 435.
Nickel:				
Ore and concentrate	4,795	10,824	--	All to Finland.
Metal including alloys, all forms	37,526	29,474	11,239	Netherlands 5,339; West Germany 4,203.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	34,080	33,212	27,585	Japan 2,604; West Germany 1,511.
Silver:				
Waste and sweepings[2] value, thousands	[r]$490	$1,150	--	United Kingdom $588; West Germany $544.
Metal including alloys partly wrought troy ounces	796,830	963,653	NA	Sweden 572,636; West Germany 134,969; United Kingdom 130,660.
Tin: Metal including alloys, all forms	67	78	--	Denmark 32; West Germany 25.
Titanium: Ore and concentrate	619,329	470,223	NA	NA.
Zinc:				
Ore and concentrate	18,349	23,627	--	Belgium-Luxembourg 17,071; West Germany 5,437.
Blue powder	5,743	5,674	NA	NA.
Ash and residue containing zinc	3,515	3,236	--	West Germany 1,696; United Kingdom 1,540.
Metal including alloys, all forms	68,245	64,068	9,147	Sweden 12,547; West Germany 12,462; United Kingdom 10,431.
NONMETALS				
Abrasives, n.e.s.:				
Artificial: Corundum and silicon carbide	52,058	50,554	NA	NA.
Grinding and polishing wheels and stones	736	764	3	Finland 249; Sweden 139.
Barite and witherite	3,612	1,611	--	Finland 1,435; Sweden 176.
Cement	303,264	49,189	NA	Liberia 45,832; United Kingdom 2,662.
Clays, crude	70	283	--	France 100; Sweden 71; Ivory Coast 49.
Feldspar	77,634	61,032	--	United Kingdom 13,025; West Germany 5,643.
Fertilizer materials: Manufactured value, thousands	$237,233	$233,933	NA	NA.
Graphite, natural	8,274	8,244	NA	NA.
Lime	4,898	7,262	--	Liberia 7,028; Sweden 234.
Magnesite	19,247	12,865	NA	NA.
Mica, unspecified	2,301	1,820	--	Netherlands 531; Portugal 208.
Pyrite, unroasted	210,459	171,883	--	Italy 104,815; West Germany 59,425.
Stone, sand and gravel	314,882	340,511	404	Iceland 81,958; France 34,719; unspecified 131,847.
Talc, steatite, soapstone, pyrophyllite	53,203	50,032	--	United Kingdom 13,227; Netherlands 12,448; Sweden 7,797.

See footnotes at end of table.

Table 3.—Norway: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Gas, natural: Gaseous million cubic feet	889,834	863,834	--	West Germany 487,217; United Kingdom 376,617.
Petroleum:				
Crude thousand 42-gallon barrels	152,255	153,837	--	United Kingdom 120,420; Netherlands 14,344.
Refinery products, unspecified do	20,601	20,477	273	West Germany 5,685; Denmark 2,546; United Kingdom 2,090.

[r]Revised. NA Not available.

[1]Table prepared by Jozef Plachy.

[2]May include other precious metals.

Table 4.—Norway: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate thousand tons	1,243	1,137	122	Suriname 317; Jamaica 251; Australia 219.
Metal including alloys, all forms	58,421	62,400	284	West Germany 29,423; Sweden 12,930.
Chromium: Ore and concentrate	27,203	23,311	--	Albania 22,790; Greece 499.
Cobalt: Metal including alloys, all forms	502	341	NA	Netherlands 222; Canada 115.
Copper: Metal including alloys, all forms	31,616	30,419	78	West Germany 11,643; Sweden 7,592.
Iron and steel: Metal:				
Scrap	23,571	4,950	--	Denmark 2,433; United Kingdom 1,026.
Pig iron, cast iron, related materials	14,649	10,099	1	Sweden 3,010; Netherlands 2,461.
Steel, primary forms	123,545	146,520	(2)	Netherlands 98,240; West Germany 33,762.
Semimanufactures thousand tons	1,024	1,115	4	Sweden 196; West Germany 189; Belgium-Luxembourg 70.
Lead: Metal including alloys, all forms	12,942	14,409	101	United Kingdom 4,555; Denmark 3,957; Sweden 3,744.
Magnesium: Metal including alloys, all forms	355	513	447	West Germany 33; Sweden 18.
Manganese: Ore and concentrate, metallurgical-grade	484,640	764,085	50	Republic of South Africa 286,256; Gabon 208,456; Brazil 109,799.
Mercury 76-pound flasks	29	464	29	West Germany 319; Netherlands 87.
Molybdenum: Metal including alloys, all forms	2	2	--	All from United Kingdom.
Nickel:				
Matte and speiss	84,252	62,419	25	Canada 47,930; Botswana 5,459.
Metal including alloys, all forms	380	306	28	West Germany 80; United Kingdom 72.
Silver: Metal including alloys, unwrought and partly wrought thousand troy ounces	[r]1,806	2,685	NA	West Germany 867; Switzerland 693; United Kingdom 662.
Tin: Metal including alloys, all forms	815	685	1	United Kingdom 377; Denmark 108.
Titanium: Oxides	1,053	1,038	202	West Germany 709; Spain 28.
Zinc:				
Ore and concentrate	109,986	93,619	--	Sweden 69,530; Canada 8,331.
Ash and residue containing zinc	28,731	24,787	NA	Sweden 23,531; Denmark 1,254.
Metal including alloys, all forms	4,164	6,357	1	Denmark 1,820; Sweden 1,801; Finland 867.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	18,125	12,206	26	Iceland 11,971; West Germany 98.
Artificial: Corundum and silicon carbide	2,389	2,711	67	United Kingdom 975; West Germany 935.
Dust and powder of precious and semi-precious stones including diamond value, thousands	$6	$4	$1	Netherlands $2; United Kingdom $1.
Grinding and polishing wheels and stones	1,163	1,046	96	West Germany 263; Austria 253; Sweden 185.
Barite and witherite	100,991	87,836	118	Morocco 32,860; Iceland 29,343; Netherlands 17,870.

See footnotes at end of table.

Table 4.—Norway: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Boron materials:				
Crude natural borates	5,910	6,218	6,218	
Oxides and acids	249	155	14	France 53; Italy 40; West Germany 28.
Chalk	9,334	8,723	22	Denmark 4,450; Sweden 3,398.
Clays, crude	r147,865	123,259	5,958	United Kingdom 77,895; Greece 19,938.
Cryolite and chiolite	4,547	7,166	--	All from Denmark.
Fertilizer materials: Manufactured	350,640	329,817	1,393	West Germany 66,059; Spain 58,197; France 50,849.
Fluorspar	43,319	35,846	3	Italy 11,348; East Germany 7,993; Morocco 7,186.
Gypsum and plaster	124,714	145,463	5	France 102,993; Sweden 40,734.
Phosphates, crude	402,098	461,447	36,686	U.S.S.R. 238,466; Sweden 131,021.
Salt and brine	518,190	518,176	6	Netherlands 351,343; Spain 66,789.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	47,390	33,542	1	Netherlands 16,128; United Kingdom 6,551; West Germany 3,391.
Sulfate, manufactured	3,656	3,599	NA	Sweden 3,003; U.S.S.R. 280.
Stone, sand and gravel	846,322	833,002	685	Sweden 357,447; United Kingdom 138,984; Belgium-Luxembourg 104,352.
MINERAL FUELS AND RELATED MATERIALS				
Coal, all grades including briquets	692,795	805,218	529,660	Poland 88,690; France 63,530.
Coke and semicoke	492,448	463,209	1,120	United Kingdom 289,713; France 65,880; West Germany 64,479.
Petroleum:				
Crude thousand 42-gallon barrels	28,475	21,357	--	United Kingdom 16,369; Saudi Arabia 2,658; U.S.S.R. 1,123.
Refinery products do	31,587	36,409	2,483	East Germany 4,931; Sweden 4,609; U.S.S.R. 4,580.

rRevised. NA Not available.

[1] Table prepared by Jozef Plachy.

[2] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Reserves of metals in ore at key Norwegian mines were reported during the year by Bergwerks Nytt, a technical journal.[3]

Copper.—In July 1983, the Sulitjelma Mine, about 30 kilometers west of Fauske, reverted from Elkem to the state of Norway, when the company's mining concession expired and mining operations ceased. The Norwegian Parliament decided to continue operations at the mine through the state-owned company A/S Sulitjelma Gruber, but the smelter operations were discontinued. No compensation for the mine was given to Elkem, but compensation for other fixed assets such as a flotation plant, workshops, etc., was to be decided by independent appraisal. Elkem also decided to close its Skorovas Gruber Mine near Namsskogan in May 1984. The mine has produced modest quantities of copper and zinc concentrates.

A/S Sydvaranger has signed an option and sales contract with Outokumpu Oy of Finland for its Bidjövagge copper mine located in northern Norway near the Finnish border. Outokumpu has an option until 1985 to buy the mine.

In 1983, Norway had six mines and four separate flotation plants producing various amounts of copper concentrates. Norway's reserves of copper ore in 1981 amounted to 617,000 tons of copper metal content (demonstrated) and 126,000 tons (inferred) for a total of 743,000 tons, sufficient for maintaining production for 26 years at the present level.

Iron Ore.—Government-owned Norsk Jernverk operated its Rana Gruber Mine near the Arctic Circle at Mo i Rana. In 1983, 1.1 million tons of iron concentrate was produced, of which 874,000 tons was used in the steel plant at Mo and 315,000 tons was exported. During the year, the mine was closed for 9 weeks. In August, the company started production of a special magnetite concentrate containing 71.7% iron, compared with other production containing 65% iron; recovery was 76.7%. New crushing equipment was also started up in the mine's Ortfjell pit.

In 1983, Norsk Jernverk requested $200 million from the Norwegian Government to refinance its debts. Simultaneously the company submitted a plan for rationalizing operations by retaining its present functions of iron ore mining, electric pig iron production, oxygen steelmaking, and a section mill. The company believes that this will help it to become profitable by 1985. In 1983, Norsk Jernverk increased its sales to about $200 million, for an operating loss of about $50 million after depreciation, but before financial charges. The company produced 1.1 million tons of iron ore, 556,000 tons of pig iron, 727,000 tons of crude steel, 219,000 tons of heavy sections, 133,000 tons of merchant mill products, and 117,000 tons of tin and electrical sheets.

Elkem operated electric-furnace facilities at seven locations producing ferrosilicon. The Sauda plant, west of Karmöy on the Sauda Fjord, had nine units with a total capacity of 125 megawatts and 800 employees. Bremanger Smelterverk operated five units totaling 92 megawatts and 487 employees. Norwegian reserves of iron ore in 1981 were reported, as follows: Demonstrated reserves of 154.9 million tons of iron content and inferred reserves of 5.1 million tons of iron content for a total of 160 million tons, sufficient to sustain present production levels for 70 years.

Lead.—In 1983, A/S Bleikvassli Gruber, near Hemnes, not far from Mo, and Bergverkselskapet Nord-Norge A/S's Rana Mine produced modest amounts of lead concentrates. Norwegian reserves of lead ores in 1981 were reported, as follows: Demonstrated reserves of 29,000 tons of lead metal in ore and inferred reserves of 18,000 tons of lead metal in ore for a total of 47,000 tons, sufficient for maintaining present levels of production for 16 years.

Titanium.—The Norwegian Government has ratified the startup of a new ilmenite pelletizing facility at Tyssedal, east of Bergen. The plant is to process 350,000 tons of ilmenite concentrate per year supplied by Titania A/S mines in the Dalane area of Rogaland County. The project is to provide employment for the former aluminum workers from the shutdown plant at the same location. The former operator of the aluminum plant, the Government-owned DNN Industries A/S, formerly known as DNN Aluminium A/S, was to provide hydroelectric power to the new plant, which is to operate as K/S Ilmenittsmelterverket A/S. The plant is to produce about 200,000 tons per year of 75% TiO_2 titanium slag and 108,000 tons per year of byproduct pig iron. The latter was being considered as raw material for the Bergens Jernstoperi A/S steel plant, which was considering moving into the area. Demonstrated Norwegian reserves of ilmenite ore in 1981 were 20.5 million tons of titanium metal content, sufficient to maintain production for the next 70 years at the present level.

Zinc.—Det Norske Zinkkompani A/S, wholly owned by Boliden AB of Sweden, was assessing plans for modernizing its electrolytic plant at Eitrheim-Odda, located on the Hardanger-Sör Fjord. A decision to expand capacity of the smelter from 90,000 to 200,000 tons per year was expected in 1984, and the new capacity could be onstream in 1986. Zinc production was running near full capacity in 1983. Norwegian reserves of zinc ores in 1981 were reported, as follows: Demonstrated reserves of 546,000 tons of zinc metal in ore and inferred reserves of 138,000 tons of zinc metal in ore for a total of 684,000 tons, sufficient for maintaining production at present levels for 23 years.

NONMETALS

Cement.—A/S Norcem was the country's only cement producer, formed by the merger of Norway's three cement works. Norcem was one of the largest industrial groups in Norway. Its three cement plants, at Slemmestad near Oslo, at Dalen farther south on the coast, and at Kjøpsvik on the north coast, had a combined capacity of 2.1 million tons per year. Slemmestad and Kjøpsvik each had a wet-process kiln, and Dalen had two dry-process kilns. At one time Norcem was Norway's largest oil consumer, but conversion to coal and waste petroleum coke changed this position.

Dolomite.—In 1983, production of dolomite was limited to two companies of importance: A/S Norwegian Talk produced about 600,000 tons of dolomite from the Hammerfall Quarry near Bodø. Most production was sold to Norsk Hydro A/S for the manufacture of magnesium metal, or was used to make filler-extender pigments. The other major producer, Franzefoss Bruk A/S, quarried and processed dolomite at Ballangen, south of Narvik. The deposit was essentially dolomitic marble. The plant produced fillers down to 40 micrometers and glass grades up to 120 millimeters for chemical and metallurgical uses. Granulated grades were also produced for agricultural use in Denmark, Norway, and Sweden. The other main markets were glass, mineral insulation, and custom grinders in Denmark, the Federal Republic of Germany, and the Netherlands.

MINERAL FUELS

In 1983, about 88% of Norway's primary energy output of about 92 million tons of standard coal equivalent was petroleum and natural gas, 11.5% was hydroelectric power, and about 0.5% was bituminous coal. All the natural gas and over three quarters of the oil produced were exported.

Coal.—Coal production at Government-owned Store Norske Spitsbergen Kullkomani A/S's Longyearbyn and Svea Mines increased substantially to 500,000 tons.

Hydroelectric Power.—Production of hydropower reached a record 106.2 billion kilowatt hours, and a 5.8-billion-kilowatt-hour equivalent of surplus water was bypassed by the powerplants as lines were fully loaded for domestic consumption and exports to Denmark and Sweden across the Kattegatt. Construction of a second cable to Denmark was being considered.

Petroleum and Natural Gas.—Hydrocarbon production totaled a record of about 385 million barrels of oil equivalent valued at about $10 billion, compared with $8 billion in 1982. Oil production increased 16% to 614,000 barrels per day reflecting an increased Statfjord output. Gas production declined by 10% to 170 billion barrels of oil equivalent; natural gas liquids production totaled 10 million barrels. Statoil and Norsk Hydro estimated that the pipeline to pump oil from Gullfaks and Oseberg Fields via Øygarden to Mongstad on the mainland would cost more than $293 million. Given a Storting (Parliament) go-ahead, startup could be scheduled for 1989.

Drilling activity in the North Sea declined in 1983 to 3,897 meters from 4,380 in 1982. Forty new boreholes were begun in 1983 versus 49 in 1982. Seven operators drilled the holes, of which three Norwegian companies drilled 33 holes. Thirty-three holes were exploratory holes, seven were demarcation holes. Hydrocarbons were found in 10 holes. In all, 16 drilling vessels were used.

In the winter of 1983, year-round drilling had begun north of the 62d parallel at the Traena Bank with the West Vanguard rig. In 1983, at Halten Banken, drilling also started with Dyvi Delta. Only at Tromsö Flaket was drilling expected to be delayed for environmental reasons until 1985 or 1986.

Foreign oil companies were given unexpected prominence in Norway's eighth licensing round; they were nominated operators for 6 of the 14 licenses awarded, 4 of which covered technically demanding territory north of latitude 62° N. Esso Exploration and Production Co. was particularly favored, winning a 15% share in bloc 34-7, the most attractive bloc on offer, as technical assistant to the operator, Saga Petroleum A/S, and also became operator for another bloc. Other foreign operators were Elf Aquitaine Norge A/S, Shell Oil Co., Norvan, Conoco Inc., Total Cie. Française des Pétroles, and Mobil Development Norway A/S. The 14 licenses covered 16 blocs including: Tromsö Flaket (5 fields), Halten Banken (4 fields), and in the North Sea, south of the 62d parallel the remainder.

The Norwegian oil directorate decided to conduct the first seismic studies on the Continental Shelf around Jan Mayen Island, at a cost of $13 million. Studies are to cover 3,000 kilometers with seismic lines in Icelandic and Norwegian territory. According to an agreement between the two countries, Iceland has the right to a 25% share of any productive finds in this part of the shelf without being required to share exploration expenses.

Shell confirmed Troll Field as one of the largest offshore gas discoveries. Norsk Hydro estimates that it contains 1,580 billion cubic meters of gas, making it larger than the Netherlands Groningen Field (about 1.5 billion cubic meters) hitherto the largest in Europe. It is now expected to be developed only after Sleipner Field, and could supply as much gas as projected Soviet deliveries to Western Europe, although at a much higher price. The Troll Field is located 60 kilometers west of Mongstad.

By yearend the Norwegian Government concluded a draft contract to supply to the United Kingdom up to $30 billion worth of natural gas from the Sleipner Field; the gas would make up for a projected shortfall by British Gas Corp. after 1990. The deal, at an unreported but estimated price of $4 to $4.15 per thousand cubic feet, seems to be more attractive to Norway than a sale to the Federal Republic of Germany who insisted on removal of the high carbon dioxide content of the gas at the offshore platform.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Norwegian krone (NKr) to U.S. dollars at the rate of NKr7.25=US$1.00 for 1983.

[3] Vokes, F. M. Reserver Ved de Norsk Bergverk (Reserves in Norweigian Mines). Bergverks Nytt (Trondheim, Norway). V. 29, No. 11, Nov. 1983, pp. 4-5.

The Mineral Industry of Pakistan

By Kevin Connor[1]

In recent years the traditional view that Pakistan has held little potential for metalliferous mineral deposits has been somewhat modified. The Saindak copper deposits discovered in the 1960's have since been recognized as a part of a much more extensive porphyry copper district. The increased pace of mineral exploration in the late 1970's and early 1980's has also revealed substantial deposits of antimony ores, iron, lead, and zinc. Although the project economics and securing of financing for the development of the aforementioned minerals remained a major problem in 1983, positive progress was registered in plans for the inception of a metals mining and processing industry within Pakistan during the sixth 5-year plan (July 1983 to June 1988). As part of those plans, during 1983, the Government set up a mining-resource development bank. Initial funding for the bank was $3.8 million. The bank was expected to extend credit to private companies for the development of mineral deposits within the country. A separate Government allocation of $16 million included in the sixth-development-plan period was targeted for infrastructure development in mining areas.

The Baluchistan Development Authority (BDA) initiated a minerals development program during the year for the southwest Province. The program was to evaluate the development potential for Provincial deposits of barite, chromite, coal, fluorite, manganese, and sulfur; along with the production of ferroalloys. The BDA mined barite, fluorite, and quartzite in Kalat, Khuzdar, and Las Bela Districts; sulfur in Chagai; and chromite in Zhob and Las Bela. The BDA was also constructing a 3,000-ton-per-year sulfur refinery plant at Koh-e-Sultan.

Also during the year, the Ministry of Natural Resources, which is based in Islamabad, initiated the transfer of the Pakistan Mineral Development Corp. (PMDC) from Karachi to the nation's new capital at Islamabad. The PMDC, as an agency of the Ministry, handled all mineral-related matters in Pakistan except the Saindak copper deposit, which has been handled exclusively by the Resource Development Corp.; nuclear materials, which have been handled by the Pakistan Atomic Energy Commission; and oil and gas, which have come under the jurisdiction of the Oil and Gas Development Corp.

The Geological Survey of Pakistan (GSP) announced a number of mineral finds during the year. Four new copper deposits were identified at Koh-e-Daleel, Dastaken, Darbancha, and Ziarat Pir Sultan, all in Baluchistan Province. Copper was also discovered in Las Bela District, along with barite, chromite, and manganese. The GSP confirmed during the year 6 million tons of lead and zinc reserves in the Khuzdar area of Kalat, plus large deposits of barite, fluorite, and dolomite. Within Sibi District, gypsum, coal, and silica sand were located. Outside of Quetta, chromite, magnesite, and limestone were discovered. The survey completed the geological mapping of the entire Province of Baluchistan, with some maps and reports completed by yearend. The GSP undertook six special projects, four of which were in Baluchistan, and five of which were coal related. These were the Chagai mineral project, Dukki Barkhan Coalfield project in Loralai District, the Sharigh-Khost-Khanai Coalfield projects, and the Narwar Coalbelt project around Quetta.

PRODUCTION AND TRADE

The minerals industry in Pakistan remained limited during 1983, with its main products being natural gas, oil, cement, coal, and a variety of industrial minerals of low unit value. The country continued to produce virtually no metalliferous ores; only chromite and bauxite were mined in quantities exceeding a few hundred tons total for the year. Among the industrial minerals, barite, gypsum, limestone, salt, and a variety of ornamental stones were the dominant products. Of the major mineral commodities produced, the most substantial increases were registered in oil, natural gas, and coal production. Crude oil production increased 20% to approximately 13,000 barrels per day.[2] This increase was attributed to the startup in production of Union Texas Co.'s operation at Khaskheli near Karachi. Natural gas production increased 8% over the 1982 production. Pakistan was almost 70% self-sufficient in energy requirements during 1983. The 30% balance was met through imports of 90,000 barrels per day of crude oil and 30,000 barrels per day of petroleum products. High petroleum import requirements continued to strain the country's trade balance of payments.[3] Coal production increased 31% to slightly over 2 million tons. There was also a registered increase of approximately 4% in the cement manufacturing industry.

Mineral exports from Pakistan remained an insignificant item of trade. India and the United Arab Emirates were the major recipients, with India receiving some crude petroleum and petroleum products, and the United Arab Emirates importing crude fertilizer materials. Fuel needs remained Pakistan's largest import item, with crude petroleum and petroleum products accounting for $1.5 billion of the country's total import needs of $5.5 billion. Saudi Arabia was the major supplier of petroleum to Pakistan and the country's major import trading partner. China, the Federal Republic of Germany, Japan, the United Arab Emirates, and the United States also supplied raw minerals, as well as semifinished and finished mineral products.

Production of indigenous phosphate rock for fertilizer manufacture began in 1983 at Kakul in the northeast. With installation of a crushing and grinding plant planned for 1984-85, the import requirements of the superphosphate plants at Faisalabad and Jaranwala for rock feedstock should be eliminated. The new cement manufacturing facilities at Dandot and Kohat were put online during March and June 1983, respectively, and seven other cement manufacturing facilities were in various stages of construction.

Table 1.—Pakistan: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982^{p}	1983^{e}
METALS					
Aluminum: Bauxite, gross weight	1,640	1,618	2,087	1,167	1,300
Antimony ore:					
Gross weight	31	40	90	51	60
Metal content^{e}	6	10	20	20	13
Chromium: Chromite, gross weight	2,638	3,115	1,427	3,028	3,000
Iron and steel:					
Pig iron[2] thousand tons	--	--	383	550	700
Mild steel products do.	365	400	^{r} ^{e}400	^{r} ^{e}550	700
Manganese ore, gross weight	110	186	96	80	100
NONMETALS					
Abrasives, natural: Emery	1,133	1,395	862	870	900
Barite	34,200	14,054	23,929	26,438	26,000
Cement, hydraulic thousand tons	3,418	3,336	3,538	3,657	3,800
Chalk	1,595	3,426	1,311	1,610	1,700
Clays:					
Bentonite	1,441	1,504	1,130	927	1,000
Fire clay	56,168	55,139	59,633	68,629	69,000
Fuller's earth	40,331	24,463	20,558	14,113	14,000
Kaolin (china clay)	15,114	27,162	38,527	41,279	42,000
Other	^{e}70,000	66,000	86,000	105,000	105,000
Feldspar	14,851	10,898	10,494	9,215	10,000
Fluorspar	791	592	819	819	800

See footnotes at end of table.

Table 1.—Pakistan: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Gypsum, crude	343,000	568,000	393,000	309,000	325,000
Magnesite, crude	2,748	1,525	1,551	1,688	1,700
Nitrogen: N content of ammonia	385,600	350,000	445,083	464,825	500,000
Pigments, mineral, natural: Ocher	1,028	326	1,889	1,889	1,900
Salt:					
Rock thousand tons	512	506	562	534	500
Marine do.	348	369	495	224	225
Total do.	860	875	1,057	758	725
Sand and gravel:					
Gravel	83,000	26,000	[2]12,000	12,000	12,000
Sand:					
Bajri and common	18,086	46,908	60,494	11,220	11,500
Glass	91,000	94,000	82,000	76,000	80,000
Sodium compounds, n.e.s.:					
Caustic soda	37,831	39,181	38,963	40,548	41,000
Soda ash, manufactured	75,258	87,911	101,158	107,190	110,000
Stone:					
Aragonite and marble	102,000	114,000	100,000	96,000	100,000
Dolomite	13,904	21,062	32,284	88,716	90,000
Limestone thousand tons	3,297	2,984	3,192	3,249	3,300
Strontium minerals: Celestite	678	250	288	272	300
Sulfur:					
Native	729	800	480	650	650
Byproduct, all sources[e]	14,000	14,000	14,000	19,000	20,000
Total	14,729	14,800	14,480	19,650	20,650
Talc and related materials: Soapstone	27,200	30,000	24,997	22,568	25,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, all grades thousand tons	1,329	1,695	1,524	1,602	2,100
Gas, natural (sales) million cubic feet	[r]201,081	[r]244,190	285,804	308,198	[2]332,315
Natural gas liquids[e] thousand 42-gallon barrels	38	40	40	40	45
Petroleum:					
Crude do.	[r]3,711	[r]3,566	3,554	3,965	[2]4,768
Refinery products:					
Gasoline do.	4,015	3,650	[e]4,000	[e]4,000	4,000
Jet fuel do.	4,015	4,380	[e]4,500	[e]4,500	4,500
Kerosine do.	1,460	1,460	[e]1,700	[e]1,700	1,700
Distillate fuel oil do.	8,030	8,395	[e]9,000	[e]9,000	9,000
Residual fuel oil do.	8,030	9,490	[e]8,000	[e]9,000	9,000
Lubricants do.	365	730	[e]600	[e]800	800
Other do.	2,190	2,555	[e]6,200	[e]5,000	5,000
Refinery fuel and losses do.	2,190	2,555	[e]3,000	[e]3,000	3,000
Total do.	30,295	33,215	[e]37,000	[e]37,000	37,000

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through Apr. 1, 1984.

[2] Reported data represented production during the fiscal year, July 1 through June 30.

Table 2.—Pakistan: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Chromium: Ore and concentrate	--	6,000	6,000	
Iron and steel: Metal:				
Scrap	210	950	--	All to Japan.
Pig iron, cast iron, related materials	--	81,875	--	India 78,600; Bangladesh 3,275.
Semimanufactures:				
Bars, rods, angles, shapes, sections	--	275	--	Sri Lanka 235; Afghanistan 19; United Arab Emirates 15.
Universals, plates, sheets	--	11	--	Yemen (Aden) 10; Republic of Korea 1.
Tubes, pipes, fittings	--	18	--	All to Kenya.

See footnotes at end of table.

Table 2.—Pakistan: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982 United States	Destinations, 1982 Other (principal)
METALS —Continued				
Silver:				
Ore and concentrate[2] value, thousands	$37	$784	--	All to United Kingdom.
Metal including alloys, unwrought and partly wrought do	--	$7	--	Kuwait $6; Saudi Arabia $1.
Tin: Metal including alloys, all forms	--	26	--	Sri Lanka 25.
Other:				
Oxides and hydroxides	1,381	--		
Base metals including alloys, all forms	--	31	--	France 10; Italy 9; Saudi Arabia 7.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	10	6	--	France 3; Saudi Arabia 2; Bangladesh 1.
Boron materials: Crude natural borates	--	144	--	Bangladesh 100; Japan 44.
Clays, crude	424	120	--	Bangladesh 95; United Arab Emirates 25.
Fertilizer materials:				
Crude, n.e.s	94,703	157,906	200	United Arab Emirates 134,970; Qatar 18,881.
Manufactured:				
Nitrogenous	2,971	--		
Phosphatic	216	--		
Nitrates, crude	--	6,571	--	All to Iran.
Phosphates, crude	59	--		
Precious and semiprecious stones other than diamond: Natural value, thousands	--	$1,710	$202	West Germany $574; Hong Kong $556; Thailand $169.
Salt and brine	6,679	4,629	--	Afghanistan 1,793; Burma 900; Kuwait 647.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	17,989	7,550	39	Italy 3,000; Japan 1,591; Singapore 600.
Worked	([3])	145	--	United Arab Emirates 100; Kuwait 28; Hong Kong 16.
Gravel and crushed rock	647	345	--	Bangladesh 117; Somalia 87; Singapore 70.
Limestone other than dimension	164	465	--	Kuwait 461.
Sand other than metal-bearing	140	1,001	--	All to United Arab Emirates.
Unspecified	477	--		
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	--	560	--	Iran 406; Sri Lanka 88.
Coal: All grades excluding briquets value, thousands	$29	--		
Coke and semicoke	--	25,658	--	Romania 25,038; Bangladesh 620.
Petroleum:				
Crude thousand 42-gallon barrels	395	--		
Refinery products: Residual fuel oil do	6,767	4,207	--	United Arab Emirates 1,185; Yemen (Sanaa) 980.

[1] Table prepared by Virginia A. Woodson.
[2] May contain platinum-group metals.
[3] Unreported quantity valued at $3,270,000.

Table 3.—Pakistan: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	--	29,914	20	West Germany 27,592; Japan 1,125; United Kingdom 719.
Metal including alloys:				
Scrap	--	12,212	171	Kuwait 4,421; United Arab Emirates 2,083; United Kingdom 1,192.
Unwrought	2,687	5,781	1,961	United Kingdom 997; U.S.S.R. 642; Romania 418.
Semimanufactures	8,429	13,599	875	Canada 3,000; Switzerland 2,403; Japan 1,935.
Chromium: Oxides and hydroxides	--	30	--	China 15; West Germany 13; Italy 2.
Copper:				
Ore and concentrate	59	1	--	All from United Kingdom.
Metal including alloys:				
Scrap	--	448	--	United Arab Emirates 358; Singapore 48; Kuwait 20.
Unwrought	178	695	--	Belgium-Luxembourg 425; United Kingdom 212; Netherlands 47.
Semimanufactures	6,670	5,768	516	Japan 2,833; United Kingdom 587; France 496.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	312,980	524,327	--	Brazil 158,213; India 100,658; Canada 93,551.
Pyrite, roasted	([2])	17	--	All from Australia.
Metal:				
Scrap	484,612	157,363	58,635	United Kingdom 24,814; Switzerland 24,142; West Germany 14,123.
Pig iron, cast iron, related materials	19,031	321	32	United Arab Emirates 159; West Germany 76; Canada 32.
Ferroalloys:				
Ferromanganese	50,591	3,948	--	China 2,432; Norway 957; Japan 206.
Unspecified value, thousands	$2,720	$2,460	$13	China $605; West Germany $286; Norway $268.
Steel, primary forms	159,086	219,343	2,604	Australia 53,172; United Kingdom 52,091; China 26,345.
Semimanufactures:				
Bars, rods, angles, shapes, sections	114,369	39,859	210	Japan 23,843; West Germany 5,246; Belgium-Luxembourg 2,835.
Universals, plates, sheets	467,218	421,140	45,506	Japan 99,292; West Germany 60,426; Australia 53,958.
Hoop and strip	4,890	3,971	42	Japan 2,229; Republic of Korea 537; West Germany 474.
Rails and accessories	17,515	403	--	Portugal 180; Sweden 118; West Germany 57.
Wire	10,820	10,233	331	China 5,103; Japan 3,137; Republic of Korea 837.
Tubes, pipes, fittings	41,152	41,297	1,292	Japan 15,691; West Germany 8,279; France 5,766.
Castings and forgings, rough	1,890	788	3	Japan 271; Spain 149; West Germany 112.
Lead:				
Ore and concentrate	232	205	--	Morocco 195; Singapore 10.
Oxides	--	673	--	West Germany 363; China 220; Belgium-Luxembourg 33.
Metal including alloys:				
Scrap	--	20	--	All from Yemen (Sanaa).
Unwrought	2,082	2,731	100	China 807; Australia 734; United Kingdom 400.
Semimanufactures	59	76	--	Australia 52; West Germany 9; Japan 9.
Manganese:				
Ore and concentrate, metallurgical-grade	214	--		
Oxides	--	1,054	18	Singapore 675; China 272; Japan 60.
Mercury 76-pound flasks	--	2,031	319	China 957; Italy 493; West Germany 203.

See footnotes at end of table.

Table 3.—Pakistan: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Molybdenum: Metal including alloys, all forms value, thousands	--	$28	$7	Japan $6; Hungary $5; Netherlands $5.
Nickel:				
Ore and concentrate	386	18	--	All from Australia.
Matte and speiss	--	51	1	United Kingdom 21; United Arab Emirates 16.
Metal including alloys:				
Unwrought	46	125	--	Canada 77; United Kingdom 21; West Germany 17.
Semimanufactures	146	72	3	Canada 19; United Kingdom 19; West Germany 17.
Tin: Metal including alloys:				
Unwrought	174	16	--	Malaysia 9; West Germany 4; United Kingdom 2.
Semimanufactures	21	2	--	Japan 1; United Kingdom 1.
Titanium: Oxides	--	1,809	18	United Kingdom 639; Australia 516.
Uranium and thorium:				
Ore and concentrate value, thousands	$15	$55	--	All from Australia.
Metal including alloys, all forms do	--	$58	--	China $54; United Kingdom $3.
Zinc:				
Ore and concentrate	--	179,259	--	All from Australia.
Oxides	--	247	--	France 112; China 62; Singapore 22.
Metal including alloys:				
Scrap	--	553	--	Spain 528; Zaire 25.
Unwrought	11,201	9,920	908	Spain 1,833; Zaire 1,497; Belgium-Luxembourg 1,452.
Semimanufactures	228	147	3	Switzerland 81; China 50; United Kingdom 7.
Other:				
Ores and concentrates	581	75	--	Denmark 51; West Germany 15; Jordan 5.
Oxides and hydroxides	6,646	--		
Base metals including alloys, all forms	44,466	119	--	Sweden 40; China 34; United Kingdom 19.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	(3)	572	99	Netherlands 326; China 41; West Germany 36.
Artificial: Corundum	--	20	--	France 15; West Germany 5.
Grinding and polishing wheels and stones	602	494	1	China 151; West Germany 86; East Germany 70.
Asbestos, crude	17,579	3,438	3	Canada 3,362; United Kingdom 30; China 23.
Barite and witherite	--	619	--	West Germany 613; China 6.
Boron materials:				
Crude natural borates	--	327	--	China 288; Turkey 37; Australia 1.
Oxides and acids	--	173	12	China 77; Turkey 38; West Germany 27.
Cement thousand tons	1,527	846	--	Republic of Korea 493; United Kingdom 82; Romania 79.
Clays, crude	82,256	7,268	933	United Kingdom 4,012; West Germany 372; China 334.
Diamond: Gem, not set or strung value, thousands	$23	--		
Diatomite and other infusorial earth	--	299	288	Netherlands 7; United Kingdom 3; West Germany 1.
Feldspar, fluorspar, related materials	--	15,045	--	United Kingdom 15,036; China 9.
Fertilizer materials:				
Crude, n.e.s	--	9,703	--	All from United Kingdom.
Manufactured:				
Nitrogenous	368,144	12,254	--	Japan 11,250; Netherlands 1,000.
Phosphatic	--	270,754	258,415	Poland 7,600; Japan 4,739.
Potassic	15,500	329	328	West Germany 1.
Unspecified and mixed	191,889	271,998	--	Netherlands 103,074; Bulgaria 99,420; Finland 35,774.

See footnotes at end of table.

Table 3.—Pakistan: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Graphite, natural	--	1,040	--	China 667; France 260; Sri Lanka 49.
Gypsum and plaster	--	344	247	West Germany 60; United Kingdom 37.
Magnesium compounds: Magnesite	--	19,456	--	China 10,642; Japan 8,543; Singapore 150.
Nitrates, crude	--	36	--	China 29; West Germany 7.
Phosphates, crude	172,099	213,946	--	Jordan 213,932; Norway 14.
Pigments, mineral: Iron oxides and hydroxides, processed	--	1,319	(4)	China 900; West Germany 325; United Kingdom 53.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$7	$56	--	Switzerland $48; France $8.
Synthetic do.	$4	$7	--	Austria $3; France $2; West Germany $1.
Pyrite, unroasted	8	--		
Salt and brine	(5)	2,040	--	West Germany 2,002; Belgium-Luxembourg 35; China 3.
Sodium compounds, n.e.s.: Carbonate, manufactured	--	641	8	Romania 531; China 69; West Germany 31.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,024	123	40	Italy 79; Netherlands 3; United Kingdom 1.
Worked	2,383	141	7	United Kingdom 117; Canada 16; Japan 1.
Dolomite, chiefly refractory-grade	--	48,165	--	Norway 48,163; Thailand 2.
Gravel and crushed rock value, thousands	$4	$3	--	France $2; Netherlands $1.
Limestone other than dimension	55	2	--	All from United Arab Emirates.
Sand other than metal-bearing	114	45	1	Netherlands 23; Australia 18; United Kingdom 3.
Sulfur:				
Elemental:				
Crude including native and byproduct	28,260	24,338	--	Kuwait 19,694; Saudi Arabia 3,730; West Germany 422.
Colloidal, precipitated, sublimed	--	105	--	West Germany 77; Poland 15; United Kingdom 13.
Sulfuric acid	--	28	1	United Kingdom 26; Canada 1.
Talc, steatite, soapstone, pyrophyllite	--	1,422	1	China 614; United Kingdom 506; Afghanistan 263.
Other: Crude	8,649	80,110	18	China 78,844; Singapore 790; Cyprus 69.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	27	12,536	45	Singapore 10,000; Hungary 2,399; United Kingdom 65.
Carbon: Carbon black	--	1,308	157	China 482; Romania 272; Japan 171.
Coal:				
Anthracite	--	429,203	85,887	Australia 198,678; Canada 144,428; Singapore 126.
Briquets of anthracite and bituminous coal	[6]120,329	4	--	All from United Kingdom.
Petroleum:				
Crude thousand 42-gallon barrels	32,017	29,707	--	Saudi Arabia 20,220; United Arab Emirates 8,117; Iran 1,370.
Refinery products:				
Liquefied petroleum gas value, thousands	--	$17	$1	China $8; West Germany $4; Japan $4.
Gasoline thousand 42-gallon barrels	792	906	--	Kuwait 902; Italy 2; Sierra Leone 1.
Mineral jelly and wax do.	307	80	1	China 58; West Germany 8; Japan 4.
Kerosine and jet fuel do.	1,985	2,548	1	Kuwait 2,502; Saudi Arabia 31.
Distillate fuel oil do.	4,640	7,933	--	All from Kuwait.
Lubricants do.	237	292	12	Singapore 124; Japan 49; United Kingdom 6.
Residual fuel oil do.	3	32	(3)	China 31.
Bituminous mixtures do.	--	164	66	United Kingdom 50; Italy 28.
Petroleum coke do.	--	22	--	All from United Kingdom.

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[1] Table prepared by Virginia A. Woodson.
[2] Unreported quantity valued at $8,000.
[3] Unreported quantity valued at $437,000.
[4] Less than 1/2 unit.
[5] Unreported quantity valued at $19,000.
[6] Excludes unreported quantity of lignite and lignite briquets.

COMMODITY REVIEW

METALS

Iron Ore.—In 1983, there were nine known iron ore deposits in Pakistan with total measured and indicated reserves of almost 500 million tons. The iron content of these reserves was assessed as relatively low, ranging from 31% to 48%. Exceptions to this range were the small deposits at Chilgazi with an iron content of 52% and Chitral with a content of 61%. Testing was completed by the Pakistan Council of Scientific and Industrial Research during the year on iron ore samples taken from the adjacent Pachinkoh and Chigendik deposits near the town of Nokundi in the District of Chagai. The results of these tests and deposit survey work showed 30 million tons of measured iron ore grading 45% to 50% iron, which could be upgraded to 65% iron. Indicated reserves at the Nokundi site were estimated at 100 million tons. Development of the Nokundi deposits could meet up to 47% of the annual raw material needs of the Government's smelter and steel furnace complex near Karachi.

Iron and Steel.—The last unit of the originally planned steel complex located at Karachi, Pakistan Steel Mill Corp. (PASMIC), was nearing completion at yearend. This unit, the cold-rolling mill, had all three major sections, the hot-rolled coil conveyor, the silting and sharing section, and the profile bending section, test operational in December. The mill was expected to be completed and totally operational by July 1984. The mill will be capable of producing a variety of construction forms, such as angles, girders, and conduits, utilizing both cold-rolled sheets and galvanized sheets. When completed, the estimated entire cost of the steel complex, with a capacity of 1.1 million tons per year of crude steel, would be just under $2 billion. The cost was higher than expected because of unforeseen material cost escalations during the approximate decade of its construction, and because of a heavy investment in infrastructural transport and communications links to Pipri, the steel plant's site. The steelworks was built with Soviet assistance.[4]

PASMIC, in its efforts to have a self-sufficient steel plant complex, instructed its Central Design Bureau to continue throughout the year with its design and fabrication work for spare parts for machinery within the complex. In hopes of eliminating costly spare-part imports, the bureau had already designed almost 500 replacement parts for various pieces of equipment, and hoped to be able to service the entire steel complex at its repair and fabrication shops by 1985-86. A feasibility study was completed in 1983 by Davy McKee Corp. of Sheffield, United Kingdom, on the construction of a tinning plant to be located near the steelworks. The Government forecast that domestic tinplate demand would rise sharply from 60,000 tons per year in 1983 to over 400,000 tons per year by mid-1988, the end of the sixth-plan period. The study by Davy McKee suggested a plant be built with a capacity of 120,000 to 150,000 tons per year with all of the steel backplate requirements for the tinning operation supplied by the Pipri steelworks. A decision on the project, estimated to take 33 months to complete, was still pending at yearend. In 1983, all of Pakistan's tinplate requirements were imported.

NONMETALS

Cement.—The State Cement Corp. Ltd. (SCCL), which controlled all cement plant operations in the country during the year, brought on-line two new 300,000-ton-per-year facilities during March and June, at Dandot and Kohat, respectively. The SCCL also increased the country's white cement production capacity 100% during the year with the addition of a 15,000-ton-per-year production line at its Daudkhel plant. The SCCL cement plant at Thatta, which began operations in December 1982, continued with improvement plans during the year and in 1984 would have the option of producing portland blast furnace slag cement equivalent to approximately 10% of the plant's annual capacity of 400,000 tons. SCCL also planned to begin construction early in 1984 on two new gray cement plants at Daudkhel and D. G. Khan, with projected capacities of 170,000 and 600,000 tons per year, respectively. The plants would increase the country's cement production by 15% if they went into production on schedule in 1986. During 1983, the SCCL finished the installation of a 400,000-ton-per-year clinker production line at its existing Mustehkam plant.

Private sector participation in the cement industry, as recently allowed by the Pakistani Government, continued throughout

1983, and by yearend, several cement plant projects were under different stages of planning or construction with locations in Cherat, Karachi, Quetta, and Taxila, and capacities ranging from 75,000 to 600,000 tons per year; these plants were all scheduled for completion in either 1985 or 1986. In addition, two plants being constructed by Creusot Loire Entreprises (CLE) of France were well underway at Dhabeji and Lakrai. The Dhabeji plant near Karachi, owned by the Pak Land Cement Co., was to have a capacity of 400,000 tons per year. The Lakrai facility, owned by the Cherat Cement Co., was also to have a capacity of 400,000 tons per year and was intended to meet the demands of the Peshawar-Islamabad District. Both of these CLE projects were slated for commissioning in the second half of 1984. Pak Land Cement also announced in 1983 that it would complete plans in 1984 for a white cement plant called Snow White Cement Ltd.

Because of the continued shortage of natural gas during the year, SCCL implemented a comprehensive plan of fuel substitution. By yearend, 28 kilns of a total of 31, representing over 95% of the installed capacity, were converted from natural gas to furnace oil for fuel. The rapid growth of installed capacity, adoption of modern technology, need for product diversification, and need for alternative fuels led to the establishment of a Cement Research Institute in Lahore, in 1983.

Fertilizer Materials.—During the second half of the year, the Pan-Islamic Chemical Co. invited companies from the preselected countries of Austria, the Federal Republic of Germany, the Republic of Korea, the Philippines, the United Kingdom, and the United States to submit proposals for the construction of a fertilizer complex to be located in Karachi. The cost to build the facility was estimated at approximately $400 million. To be constructed were a 2,500-ton-per-day diammonium phosphate (DAP) plant and related units of sulfuric and phosphoric acid. Financial institutions based in Kuwait and Saudi Arabia were committed to supply 70% of the financing, with U.S. banks providing the remainder. Construction work was expected to begin by the spring of 1984, with the completion date of the project tentatively set for the spring of 1987. Initially, all ammonia and phosphate raw materials were to be supplied from Jordan, and a majority of the facility's DAP was to be sold to the Pakistani Government. Shortly after the announcement of construction plans for the new fertilizer complex at Karachi, the Al-Ghurair Group of Dubai was reported to have completed preliminary plans for construction of a 1,000-ton-per-day DAP plant at Thatta, with the total project cost estimated at $180 million. This plant was also scheduled to be completed sometime in 1987, with production targeted for farmers of the Sind and southern Punjab Provinces. The Al-Ghurair joint venture was to offer 49% of its approximately $60 million equity to Pakistan citizens as stock. The foreign cost component of the project was estimated at $92 million.

At the new Kakul mines, a crushing and grinding plant was scheduled for installation during 1984, for providing raw product suitable for use in the existing superphosphate plants at Faisalabad and Jaranwala. The plants consumed about 67,000 tons of imported phosphate rock for processing into fertilizers during 1983. The Kakul mining operation represents Pakistan's first indigenous production of mineral phosphate available for processing into phosphate fertilizers. Also, plans continued during the year for the development of a 200,000-ton-per-year phosphate mine in the Lagarban area. This, along with the Kakul Mine, comprise the Hazara deposits, and represent Pakistan's major phosphate reserves. Pakistan was self-sufficient in production of all its urea fertilizer needs in 1983.

During the latter part of the year, the International Bank for Reconstruction and Development (World Bank) approved the financing for a 6-month study to examine Pakistan's requirements for additional fertilizer production to meet projected domestic demands through the remainder of the 1980's. The investigation was to recommend a development strategy with emphasis on phosphate fertilizer. Alternative projects were to be delineated, and specific recommendations for replacement of the ammonium sulfate plant at Daud Khel were to be made. During 1983, the country's raw phosphate and potash requirements had to be imported. The World Bank study was to examine the availability of domestic raw materials of gas, phosphate rock, potash, and sulfur from brines.

It was announced in November by the Government of Pakistan that the United Nations Development Program would provide financial assistance worth approximately $1 million for the establishment of a fertilizer research and development institute at Faisalabad. The Government of Pakistan was to supply $2 million in funding for the project, which was to start in January 1984. The general mission of the institute was (1) to test domestic and imported raw fertilizer materials and to propose ways and means of their economical use, (2) to suggest technological improvements and assist in adopting advanced technologies for production of fertilizers to suit conditions and specific requirements in Pakistan, and (3) to provide technical advisory services to the existing fertilizer production units of the National Fertilizer Corp. (NFC). Of the nine fertilizer production plants operating in Pakistan in 1983, six were operated by the Government agency NFC.

MINERAL FUELS

Coal.—Pakistan, like many other developing countries, has remained dependent on imported oil and gas for much of its energy needs. During 1983, coal utilization only accounted for 5% of the country's energy needs, with over 95% of this usage limited to fuel for brick kilns. To realize the country's sixth 5-year plan goal to reduce energy import costs, continued emphasis was placed during the year on developing the country's substantial indigenous coal resources. The Government allocated almost $200 million for the period to further delineate the country's coal resources, and to develop additional coal infrastructure, improve marketing, increase utilization, improve rail transportation, conduct coal gasification studies, and encourage public mining ventures on a cooperative basis with the Government.[5] During the 1980's, the Government hoped to increase the use of the country's coal resources in both existing and planned electrical power generating plants. Although coal production had steadily increased in recent years, approximately doubling between 1978 and 1983, the projected demand for 1988 was almost 250% of the 1983 total, which would require a continued rapid expansion and mechanization of the industry. The Government projected that coal production would rise from 2.1 million tons in 1983, to 5.4 million tons in 1988.[6] This projected tonnage would keep pace with the forecast demand and meet approximately 10% of the public's total energy needs. To expedite these measures, the Government planned to establish a National Coal Authority in 1984, which would manage and coordinate policies related to prospecting and development of the country's coal reserves.

Regarding the Government's exploration efforts in 1983, the GSP announced the finding of a large new field of high-grade coal in the Sari Sidhu, Jhang District, area of Punjab. A major drilling program began late in the year and was to continue in 1984, to delineate the field's reserves. A number of coal resource surveys were underway in Pakistan, with existing coal reserve figures at midyear estimated at 506 million tons; of which, 102 million tons was proven. Projected estimates were that these figures could double before the end of the sixth-plan period. Promising areas of investigation during 1983 were the Sonda Thatta region in Punjab, the Lahkra Coalfield of Sind, Loralai District in Baluchistan, and in the Mainwali District where the existing Makerwall collieries operated throughout the year. Most of the on-going investigations were concerned not only with evaluating reserve tonnages and coal quality, but also to assess the optimum sites for mining operations and powerplant locations. A World Bank loan of $7 million was secured in May by the Government for the Loralai District survey project, which was to concentrate on Duki Basin. The Pakistani Government agency Water and Power Development Authority (WAPDA) was carrying out the study.

Natural Gas.—Natural gas production for the country was estimated to have increased 8% over the 1982 level, to over 900 million cubic feet per day. Seventy-five percent of the production came from the Sui Field, which increased its output slightly over the 1982 performance. The Mari Gasfield contributed 20% of the total with a 40% increase in field production over its 1982 contribution; 4% came from associated oil production at the Meyal and Dhulian Oilfields and the remaining 1%, from the Toot Oilfield and Sari-Hundi Gasfields, operated by the Government's Oil and Gas Development Corp. (OGDC). The majority of the gas from the Sui Field was sold to Sui Northern Gas Pipelines Ltd. and the Sui Gas Transmission Co. Ltd. (SGTC). Sui gas supplied 70 million cubic feet per day to WAPDA for use at the Guddu thermal power station. All of the production from the Mari Gasfield was supplied to three fertilizer plants located at Daharki, Mirpur Mathelo, and Goth Machhi. An additional 27 development wells were proposed for the Mari Field to increase the daily production by a predicted 105 million cubic feet. The

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increased production was slated for fuel consumption at the Guddu power station. OGDC's Sari-Hundi Gasfields suffered a 50% decline during 1983. Efforts to revitalize the two fields were planned for 1984, but OGDC predictions for future production from the fields were not optimistic. The gas from the Sari-Hundi Fields was supplied to the Sui-Karachi gas transmission system.

Gas production from the Meyal and Dhulian Oilfields decreased 20% from the 1982 total figure, while OGDC's Toot Oilfield produced twice as much gas in 1983 as it had the previous year. Gas production from the Meyal, Dhulian, and Toot Oilfields was supplied to the Sui Northern gas transmission system. Substantial work was accomplished during the year on the development of the Pirkoh Gasfield. The production from this field was to be fed into the Sui-Karachi gas transmission system. In the first phase of development of the gasfield, a total of six wells were proposed to be drilled; of this total, four of the wells were drilled to completion, with the fifth well still being drilled at the end of December. It was planned that the field would initially produce and supply about 40 million cubic feet of gas per day, rising to 70 million cubic feet per day by yearend 1985. Simultaneous with the field's development, work on a 46-centimeter-diameter, 74-kilometer-long transmission system continued throughout 1983 to connect the field with SGTC's existing line. A compressor station with gas-turbine-driven centrifugal compressor units, which would use gas from the field's production, was also being installed at Sui. This work was part of SGTC's Indus Right Bank Pipeline Compression Project, which was installing mainline compressor stations at Shikarpur and Dadu, along with a sidestream booster station at Sari-Hundi. Upon completion of the work, scheduled for early 1984, the capacity of Sui-Karachi Indus Right Bank Pipeline would increase from 140 to 265 million cubic feet per day.

Following Government approval in 1983, Pakistan Petroleum Ltd. (PPL) began planning 1984 development work for the Kandhkot Gasfield. Planning included the drilling of producing wells and undertaking workover operations of an existing well, the Kandhokt Well No. 2. A total of nine wells to be drilled were planned for the field, all to be completed by yearend 1985. Projected production from the new development is almost 35 million cubic feet per day, all of which is slated for use in the Guddu power station's new 210-megawatt unit No. 4, which with Chinese assistance was being constructed in 1983. Also underway by PPL during the year were procurement operations for equipment to be installed at the new Sui Main limestone wellhead gas compression facilities at the Sui Field. Orders were placed for six gas turbine compressor units, each capable of generating 14,500 horsepower. The first phase of the compression facilities was expected to be commissioned in 1985.

Petroleum.—Two new oilfields at Dakhni and Laghari were discovered in Pakistan during 1983. The Dakhni Well No. 1 was drilled by OGDC to the target depth of 4,950 meters. Production potential of the Dakhni well was reported at 600 barrels per day of oil, and 8 million cubic feet of gas per day; of which, 6% was hydrogen sulfide. Well operations were shut down temporarily in August until special equipment for dealing with the dangerous hydrogen sulfide could be installed. A comprehensive development plan was being drawn up at yearend for bringing the field into commercialization as quickly as possible. As part of further delineation and development of the field, Dakhni Well No. 2 was being drilled at yearend and had reached a depth of over 3,200 meters.

In the new Laghari Field, the petroleum firm Union Texas of Pakistan Inc. had drilled two development wells to depths of 1,036 meters and 1,920 meters, discovering oil in both. The yield zone in the shallower well, Laghari Well No. 1, was reported to be about 3.5 meters thick; whereas Laghari Well No. 2 had a reported yield zone thickness of almost 80 meters. As with the Dakhni Field, rapid development of the Laghari was a priority, and production was expected to begin as early as spring 1984.

Work continued throughout 1983 on the lubricant expansion project at the National Refinery Ltd.'s plant complex at Karachi. Expansion of the existing lubricant-asphalt manufacturing facility at an estimated cost of $150 million was scheduled for completion by June 1984. The improved plant was scheduled to produce 100,000 tons of lubricant oil and 120 tons of asphalt per year when completed, and was designed to continue to use furnace oil residue from the main refinery. Depending on the quality of the imported oil refined at the National Refinery, approximately 20% to 30% of the crude was converted to a residual byproduct furnace oil. The expansion work when completed would more than double the present output capacity of the lubricant plant.

Uranium.—The Pakistan Atomic Energy Commission announced during the year the completion of a uranium exploration survey covering 60,000 square kilometers in the Sind and North-West Frontier Provinces. Particularly encouraging results were found in the Tharparkar District in Sind Province, and between Mansehra and Thakot in the North-West Frontier Province where samples yielded values of 0.2% uranium. Also, exploration efforts continued around Karachi, at the coastal locations of Gwadar, Ormara, Pasni, and Sonmiani where results indicated the presence of about 4 million tons of heavy minerals, including uranium. Other preliminary studies showed uranium in eastern Potwar on both sides of the Indus River, at Isa Khel, Mir Ali Thal, Khisor Ranges, Shanwah, Karak, Taman, Mindi, Shariqi, Larimar, Kakhad, Pir Fatehal, Tabbiser, Massan, and the Soan River area.

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[1] Physical scientist, Division of Foreign Data.

[2] Pakistan's fiscal year runs from July 1 through June 30. Textual material reported in fiscal years unless otherwise specified.

[3] U.S. Embassy, Islamabad, Pakistan. Foreign Economic Trends and Their Implications for the United States. State Dep. Airgram A-019, July 17, 1983.

[4] The Pakistan Times (Lahore). Pakistan Steel Mill To Achieve Full Production in 1985-86. June 24, 1983, p. 1.

[5] Where necessary, values have been converted from Pakistani rupees (PRs) to U.S. dollars at the rate of PRs13.15=US$1.00.

[6] Mining Journal (London). Pakistan's Mining Plans. V. 301, No. 7730, Oct. 14, 1983, pp. 273-275.

The Mineral Industry of Peru

By Doris M. Hyde[1]

The nonfuel minerals sector ended 1983 with a mixed performance record. Despite the improvement over that of 1982 of some commodities in production volume and market price, the erratic world markets caused producers to maintain a cautious approach toward new capital investment other than those involving cost-cutting measures or increased efficiency.

Unusual and destructive weather patterns caused by the "El Niño" phenomenon disrupted production from some sectors of Peru's mineral industries. Especially hard hit by flooding and landslides were areas along the northern coast and inland to the central highlands. Damages were suffered by the crude oil producers, the Talara petroleum refinery, the Chimbote steel plant, and some of the facilities at the La Oroya metallurgical center.

Peru's attempts to recover from 1982's financial pressures were unsuccessful, and the gross domestic product (GDP) fell to $16 billion.[2] Using 1970 as a base year, in real terms, this represented an unprecedented 12% decline from that of 1982. The mining sector contributed almost 10% of the real GDP in 1983. The average rate of inflation soared from 73% in 1982 to over 125% for 1983.

The year ended with a slight trade surplus. Imports declined partly because of the general recession and currency devaluations. The total value of exports also declined as a result of reduced volumes and prices for most traditional products. Exports from the minerals sector were valued at about $2.2 billion and represented a 74% share of total exports. Nonfuel mineral products made up 55% of this share, and petroleum exports the remainder.

Government Policies and Programs.—The Banco Minero del Perú (Banco Minero) continued its financial assistance to the small and medium mining sectors. During 1983, the bank dispursed about $45 million in loans, of which 60% went to the small mining sector. Under a 1981 trade protocol, the Government of France provided the Banco Minero a $7.5 million credit line for the acquisition of three small hydroelectric plants and two furnaces for the removal of mercury and arsenic from stored concentrates. The hydroelectric plants, one of 300 kilowatts and two of 200 kilowatts each, will be placed in Ancash, Cuzco, and Ayacucho. They were expected to substantially reduce mine production costs. The furnaces were to be placed at Pisco and Huacho, where about 60,000 tons of concentrates have been stored because high mercury and arsenic contents made them unmarketable. The hydroelectric plants and furnaces were expected to be in operation by late 1984 and enable some 200 inactive mines throughout these areas to reopen.

Changes were enacted in the tax structure that caused some protestations from the mining community because of the generally depressed state of the industry. A 1% tax was placed on all foreign exchange transactions. Effective January 1, 1984, the 16% sales tax paid on Southern Peru Copper Corp.'s (SPCC) Toquepala toll refining charge at the Ilo refinery of Empresa Minera del Perú (Minero Perú) was to be increased to 18%.

In 1981, a special 5% tax was placed on mineral exports. This tax expired in June 1983, and at the end of December, a new tax on mineral exports and domestic sales was enacted to be effective January 1, 1984. This tax was to be paid in advance, in soles, through customs upon presentation of the export permit. The tax rate was to be either 5% or 10% of export value and would be triggered by the referenced value of the mineral. The 5% tax rate would be effective when the reference values fell within the following ranges: copper, from $0.75 to $0.90 per pound; lead and zinc, from $0.35 to $0.40 per pound; silver, from $8.50 to $10.00 per troy ounce; gold, from $350 to $450 per troy ounce; tin, from $5.00 to $6.25 per pound; and tungsten, from $115 to $140 per ton. Any value exceeding the upper limit would be taxed at the 10% rate. If a company has three consecutive monthly balance sheets indicating a net profit under 2.5% of the f.o.b. value of sales after income tax, the export tax would be suspended until the net profit condition improved. The new export tax payments were to be creditable against the 1984 income tax.

Sharply falling crude oil reserves and a low level of exploratory drilling spurred some Government and industry officials in 1983 to press for modifications of existing legislation. Action was taken to eliminate the contract requirement to drill two wildcats within the first 2 years of exploration. Companies were also given the opportunity to acquire additional acreage.

Additional changes in petroleum legislation were sought in order to encourage foreign companies to invest the necessary capital to expand exploration activity. Low market prices for petroleum prompted the private companies, as well as state-owned Petróleos del Perú (Petroperú), to allocate their limited funds in a prudent manner.

PRODUCTION

Bad weather, labor problems, and poor world market prices all combined to cause problems in Peru's mineral sector. Companies continued to employ austerity measures in an effort to reduce unit costs and meet financial obligations.

The volumes of copper mine output, blister, and refined copper were down substantially because of an accumulated total of 107 days of strike activity at SPCC. The labor problems at SPCC were partly responsible for decreased production at Minero Perú's Ilo copper refinery, which receives its blister feedstock from SPCC. In addition, the Ilo refinery had its own labor problems and endured 32 days of shutdown, all attributable to one strike action.

The medium mining sector was primarily responsible for the increased total silver production. Refined silver output declined because of flooding and a 22-day strike at Empresa Minera del Centro del Perú's (Centromín Perú) La Oroya metallurgical complex. Silver, lead, and zinc were the commodities that enabled many of the private mining companies to end the year with net gains that surpassed the small gains, or reversed financial losses, suffered in 1982.

Iron ore production fell by 25%. Mine output was reduced to conform to lower export requirements. The troubled state-owned steel company, Empresa Siderúrgica del Perú (Siderperú), was not helped by the El Niño weather conditions early in the year, which caused an estimated $2.5 million to the facility through flooding, mudslides, and downed electrical transmission lines. The state steelmaker faced additional problems as a new private ministeelworks in Pisco absorbed a significant part of the national market.

Peru's crude oil producers continued to struggle against a natural decline from older producing fields. Secondary recovery methods, new equipment, and a few new producing wells were not enough to offset the disastrous effects of torrential rains and mudslides during the first half of the year, and output fell from 195,060 barrels per day (bbl/d) in 1982 to about 171,550 bbl/d in 1983.

Table 1.—Peru: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
METALS					
Antimony:					
Mine output, metal content	546	344	685	738	[2]713
Metal	477	427	448	432	[2]346
Arsenic, white[3]	1,415	2,475	2,164	1,663	[2]1,110
Bismuth:					
Mine output, metal content	527	497	639	613	535
Metal	527	497	639	604	[2]526
Cadmium:					
Mine output, metal content	424	490	511	600	630
Metal	190	172	307	421	[2]451
Copper:					
Mine output, metal content	390,720	366,800	342,058	356,632	[2]322,169
Copper sulfate (Cu content)	1,395	[r]1,857	2,281	2,510	[2]2,494
Metal:					
Smelter	[r]339,656	[r]323,083	279,327	294,412	[2]258,305
Refined[4]	[r]196,714	[r]195,735	175,572	194,416	[2]158,134
Electrowon	33,111	33,279	33,366	33,532	[2]32,597
Gold:					
Mine output, metal content troy ounces	[r]141,656	[r]142,041	176,057	164,547	170,618
Metal do.	56,858	57,196	55,781	69,606	72,867
Indium kilograms	3,484	3,675	3,489	3,673	2,707
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	5,444	5,705	6,069	5,774	[2]4,347
Iron content do.	3,622	3,765	4,007	3,811	2,869
Metal:					
Pig iron[5] do.	257	262	181	162	113
Ferroalloys	1,498	575	30	--	--
Steel ingots and castings thousand tons	436	447	364	274	289
Lead:					
Mine output, metal content	174,000	176,955	192,667	175,771	[2]212,600
Metal	85,706	79,939	79,236	76,990	[2]67,734
Molybdenum, mine output, metal content	1,196	2,688	2,488	2,893	[2]2,628
Selenium metal, refined kilograms	18,320	22,908	22,478	20,851	[2]19,553
Silver:					
Mine output, metal content thousand troy ounces	39,248	[r]44,419	46,940	51,252	[2]55,878
Metal do.	25,488	23,797	23,853	24,704	[2]21,724
Tellurium metal kilograms	21,233	20,920	21,310	20,726	[2]15,241
Tin, mine output, metal content	870	1,077	1,519	1,672	[2]2,391
Tungsten, mine output, metal content	564	549	521	688	720
Zinc:					
Mine output, metal content	432,000	487,596	498,890	507,111	553,070
Metal	68,195	63,829	126,159	160,733	[2]154,030
NONMETALS					
Barite	444,500	414,500	409,100	375,000	180,000
Boron materials, crude (borates)	12,000	21,000	16,644	14,000	13,000
Cement, hydraulic thousand tons	2,398	2,169	3,080	2,590	2,300
Chalk	361,800	485,174	475,000	470,000	470,000
Clays:					
Bentonite	17,851	18,200	30,500	31,000	31,000
Fire clay	14,658	13,325	8,520	8,000	8,000
Kaolin	6,563	5,500	[e]6,000	6,000	6,000
Common clay	472,000	309,800	754,256	750,000	750,000
Diatomite	7,271	7,300	7,300	7,300	7,300
Feldspar	2,176	15,600	21,600	[e]25,000	25,000
Gypsum, crude	217,490	280,000	350,000	[e]350,000	350,000
Mica	16	50	574	[e]550	550
Nitrogen: N content of ammonia	[e]80,000	61,700	97,500	84,700	85,000
Phosphates, crude: Guano	5,000	13,900	98,364	29,100	--
Salt, all types	398,820	456,987	506,000	485,000	490,000
Stone, sand and gravel:					
Dimension stone:					
Marble	12,014	12,050	3,072	[e]3,000	3,000
Slate	18,655	18,800	[e]19,000	[e]18,000	18,000
Crushed and broken stone:					
Dolomite	3,880	4,250	[e]4,300	[e]4,200	4,000
Limestone	3,772	3,175	3,800	2,590	2,500
Quartz and quartzite	1,357	1,900	[e]2,000	[e]2,000	2,000
Silica sand thousand tons	43	90	18	[e]20	20
Sand and gravel do.	2,377	3,596	2,538	2,850	2,800
Sulfur:					
Elemental:					
Native	98	105	[e]100	[e]100	100
Byproduct of metallurgy	20,000	20,000	20,000	58,000	65,000
Sulfuric acid, gross weight	53,762	51,801	170,801	226,760	200,000

See footnotes at end of table.

Table 1.—Peru: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Talc and related materials:					
Talc	1,090	1,095	[e]1,100	1,100	1,100
Pyrophyllite	5,486	7,500	[e]8,000	7,500	7,500
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	3,182	5,457	4,200	6,200	5,000
Coal: Anthracite, run-of-mine	47,429	89,471	157,000	[e]120,000	120,000
Coke, all types[e]	10,000	10,000	10,000	10,000	10,000
Gas, natural:					
Gross million cubic feet	73,118	65,500	71,600	89,800	80,000
Marketed do.	21,053	[e]21,000	[e]21,000	[e]21,000	22,000
Natural gas liquids:					
Natural gasoline and other[6] thousand 42-gallon barrels	464	353	344	320	[2]53
Propane do.	47	75	86	59	[2]6
Butane do.	9	9	9	9	[2]3
Total do.	520	437	439	388	[2]62
Petroleum:					
Crude do.	69,952	71,356	70,431	[2]71,197	[2]62,454
Refinery products:					
Gasoline:					
Aviation do.	1	--	--	--	--
Motor do.	13,088	[r]13,028	13,960	[2]13,069	[2]10,835
Jet fuel do.	2,657	[r]3,018	3,307	2,891	[2]2,718
Kerosine do.	6,156	6,741	7,003	[2]7,111	[2]6,024
Distillate fuel oil do.	11,949	12,422	13,071	12,177	[2]9,591
Residual fuel oil do.	15,462	16,656	16,907	[2]18,866	[2]21,637
Lubricants do.	141	85	124	[2]148	[2]57
Liquefied petroleum gas do.	1,237	1,148	1,410	[2]1,525	[2]1,170
Asphalt do.	181	234	256	[2]313	[2]178
Refinery fuel and losses do.	193	[r]259	199	[2]93	[2]596
Unspecified do.	104	[r]156	318	[2]1,292	[2]2,090
Total do.	51,169	[r]53,747	56,555	[2]57,485	[2]54,896

[e]Estimated. [p]Preliminary. [r]Revised.

[1] Table includes data available through July 15, 1984.

[2] Reported figure.

[3] Output reported by Empresa Minera del Centro del Perú.

[4] Includes leached and electrowon copper cathode production by Empresa Minera del Perú, at Cerro Verde I, as follows: 1979—33,111 tons; 1980—33,279 tons; 1981—33,366 tons; 1982—33,532 tons; and 1983—32,597 tons.

[5] Excludes sponge iron production as follows: 1980—33,826 tons; 1981—53,704 tons; 1982—42,969 tons (revised); and 1983—26,400 tons.

[6] Includes hexane.

TRADE

Exported volumes of all major traditional nonfuel minerals except copper and iron ore concentrate increased. Copper prices, after showing slight gains by midyear, ended 1983 below the already low levels that prevailed in January. Market prices for iron ore concentrate fluctuated somewhat, but held a steady downward trend. Other major metals gained in both volume and price with the exception of silver; the price for which began to fall during the latter part of the year. The value of nonfuel mineral exports amounted to $1.6 billion, or about 54% of total export earnings. This increase over the 41% contribution in 1982 was partly because of a reduced level of total export receipts in 1983.

Sales through the state marketing agency, Minero Perú Comercial (Minpeco), amounted to over $1.1 billion, or about 69% of total nonfuel mineral exports. Sales of silver by the Banco Central de Reserva del Perú and of silver and gold by the Banco Minero accounted for $187 million, or about 11% of nonfuel mineral exports. Sales by private concerns contributed the remainder. Discounting the bank precious metal sales, Minpeco accounted for 78% of the nonfuel mineral export value, and private sales, 22%.

The following table shows approximate values for the major mineral exports, in millions of U.S. dollars:

Commodity	Minpeco	Private	Total
Copper:			
Refined	$252	--	$252
Blister	133	--	133
Ore and concentrate	16	$42	58
Total[1]	401	42	443
Lead:			
Refined	24	--	24
Concentrate[2]	86	183	269
Total	110	183	293
Silver: Refined	273	--	[3]391
Zinc:			
Refined	109	--	109
Ore and concentrate	143	55	198
Total	252	55	307
Iron	73	--	73
Gold	--	--	[4]69
Other metals: Bismuth, cadmium, indium, selenium, and tellurium	16	--	16
Other	3	35	38
Grand total	1,128	315	1,630

[1] Includes silver content.
[2] Includes concentrates of lead, lead-silver, and silver.
[3] Includes silver sales by the Banco Central de Reserva del Perú ($116 million) and the Banco Minero del Perú ($2 million).
[4] Includes gold sales by the Banco Minero del Perú ($69 million).

Source: Carta Minera (Lima, Peru). V. 3, No. 9, Mar. 6, 1984.

Minpeco's share of mineral export sales was expected to decrease slightly in 1984 because of SPCC's September 1983 decision to cancel the agreement for sales of Toquepala output. A new limited agreement between SPCC and Minpeco covered only markets in China and South America, with the exception of Argentina.

Preliminary estimates indicated that Peru's crude oil and petroleum product exports were less than 21 million barrels valued at $545 million. This represented a decline from the almost 23 million barrels valued at $715 million exported in 1982. Other reports estimated 1983 petroleum exports at 19 million barrels valued at $491 million. Both of these estimates reflected the problems caused by turbulent weather during the first part of the year, which disrupted crude oil production, pipeline flow, and the Talara refinery operation. In June, Petroperú invoked force majeure on its crude oil export commitment to Japan. Belco Petroleum Corp. and Occidental Petroleum Corp. also exported reduced amounts of crude oil.

Table 2.—Peru: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	Destinations, 1982	
		United States	Other (principal)
METALS			
Aluminum: Metal including alloys, semimanufactures	62	--	Bolivia 41; Chile 21.
Copper:			
Ore and concentrate	92,181	--	Japan 50,122; West Germany 17,000; Republic of Korea 13,994.
Metal including alloys:			
Unwrought	262,737	11,786	Japan 60,451; United Kingdom 48,901; Italy 33,414.
Semimanufactures	11,892	5,800	Colombia 2,594; Ecuador 583; El Salvador 547.

See footnotes at end of table.

Table 2.—Peru: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	Destinations, 1982	
		United States	Other (principal)
METALS —Continued			
Iron and steel:			
Iron ore and concentrate excluding roasted pyrite	4,612	36	Japan 1,617; Republic of Korea 1,568; Yugoslavia 1,070.
Metal:			
Pig iron, cast iron, related materials	71	--	West Germany 41; France 30.
Semimanufactures:			
Bars, rods, angles, shapes, sections	2,764	--	Ecuador 2,514; Colombia 200; Bolivia 48.
Universals, plates, sheets	1,387	--	Italy 1,234; China 149; Ecuador 4.
Rails and accessories	32	--	All to Bolivia.
Wire	87	--	Colombia 32; Ecuador 20; Costa Rica 15.
Tubes, pipes, fittings	664	--	Mainly to Venezuela.
Castings and forging, rough	2,565	5	Venezuela 993; Bolivia 792; Chile 271.
Lead:			
Ore and concentrate	185,498	57,772	Belgium-Luxembourg 48,022; Japan 44,590; Mexico 13,171.
Oxides	1,812	--	Colombia 960; Venezuela 478; Ecuador 152.
Metal including alloys:			
Unwrought	66,946	9,193	Yugoslavia 8,491; Republic of Korea 8,159; U.S.S.R. 7,258.
Semimanufactures	657	84	Venezuela 561; Chile 12.
Nickel: Ore and concentrate	7,758	3,696	Finland 2,002; Japan 1,203.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$190,616	$123,195	United Kingdom $38,342; Brazil $12,977; Japan $6,080.
Tin:			
Ore and concentrate	620	320	West Germany 300.
Metal including alloys, semimanufactures	99	--	Chile 46; Ecuador 36.
Tungsten: Ore and concentrate	1,170	174	Netherlands 510; West Germany 356.
Zinc:			
Ore and concentrate	605,578	6,490	Belgium-Luxembourg 131,713; Japan 129,213; France 60,896.
Oxides	318	153	Colombia 82; Venezuela 38; Japan 17.
Metal including alloys, unwrought	247,977	45,233	Netherlands 115,893; China 10,747; Colombia 9,338.
Other:			
Ores and concentrates	210	--	Mainly to Belgium-Luxembourg.
Base metals including alloys, all forms	1,254	685	Netherlands 141; West Germany 110.
NONMETALS			
Barite and witherite	130,105	86,948	Venezuela 34,785; Ecuador 6,034; Colombia 2,338.
Boron materials:			
Crude natural borates	1,873	--	Colombia 868; Brazil 826.
Oxides and acids	296	--	Colombia 140; Ecuador 100; Brazil 36.
Cement	38,057	--	Mainly to Ecuador.
Chalk	141	--	Do.
Clays, crude	1,075	--	Ecuador 754; Colombia 260.
Fertilizer materials: Crude, n.e.s	3,526	--	Mainly to Belgium-Luxembourg.
Gypsum and plaster	2,030	--	All to Ecuador.
Sodium compounds, n.e.s.: Sulfate, manufactured	3,799	411	Brazil 1,737; Ecuador 624; Venezuela 454.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	2,560	--	Mainly to Colombia.
Worked	40	21	Venezuela 13; West Germany 6.
Dolomite, chiefly refractory-grade	160	--	All to Ecuador.
Talc, steatite, soapstone, pyrophyllite	215	--	Mainly to Ecuador.
MINERAL FUELS AND RELATED MATERIALS			
Coal: All grades excluding briquets	100	--	All to Chile.
Petroleum:			
Crude thousand 42-gallon barrels	11,464	6,670	Japan 4,792.
Refinery products:			
Gasoline, motor do	1,298	--	All to Colombia.
Distillate fuel oil do	726	298	Netherlands Antilles 1.
Lubricants do	19	--	Bolivia.[2]
Residual fuel oil do	2,701	2,379	Canada 266.
Bituminous mixtures do	139	--	Ecuador 103; Bolivia 24; Chile 12.

[1] Table prepared by John G. Panulas. Comparable 1981 data not available.

[2] Less than 1/2 unit.

Table 3.—Peru: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	Sources, 1982	
		United States	Other (principal)
METALS			
Aluminum:			
Ore and concentrate	3,735	--	Poland 2,114; United Kingdom 1,550.
Oxides and hydroxides	679	43	West Germany 635.
Metal including alloys:			
Unwrought	3,852	440	Venezuela 1,634; Canada 985; France 663.
Semimanufactures	1,869	388	West Germany 341; Belgium-Luxembourg 266.
Chromium:			
Ore and concentrate	5,540	--	Philippines 5,500; Republic of South Africa 40.
Oxides and hydroxides	35	2	West Germany 22; Japan 3; Netherlands 3.
Copper: Metal including alloys:			
Unwrought	110	--	West Germany 71; Netherlands 39.
Semimanufactures	799	119	Brazil 207; Chile 153; West Germany 54.
Iron and steel:			
Iron ore and concentrate excluding roasted pyrite	18	18	
Metal:			
Scrap	16,236	9,059	Chile 7,177.
Pig iron, cast iron, related materials	3,874	258	Republic of South Africa 3,198; Brazil 290.
Ferroalloys:			
Ferromanganese	2,087	53	Republic of South Africa 1,952.
Unspecified	1,558	39	Republic of South Africa 1,247.
Steel, primary forms	6,712	15	Chile 5,656.
Semimanufactures:			
Bars, rods, angles, shapes, sections	41,498	1,357	Canada 9,182; Japan 7,863; Spain 7,350.
Universals, plates, sheets	76,039	4,014	Japan 34,011; France 11,182.
Hoop and strip	2,760	521	Japan 1,333; Belgium-Luxembourg 340.
Rails and accessories	10,418	215	Austria 8,452; Japan 801.
Wire	2,591	118	United Kingdom 831; Argentina 730; Belgium-Luxembourg 449.
Tubes, pipes, fittings	30,743	14,513	Japan 3,530; Brazil 2,819.
Castings and forgings, rough	1,618	819	Spain 251; Japan 114.
Lead: Metal including alloys:			
Unwrought	24	22	Bolivia 2.
Semimanufactures	20	15	United Kingdom 4; Japan 1.
Magnesium: Metal including alloys:			
Unwrought	2	2	
Semimanufactures	10	9	
Manganese: Ore and concentrate	1,442	--	Mexico 1,391; Belgium-Luxembourg 51.
Nickel: Metal including alloys:			
Unwrought	18	8	Republic of South Africa 10.
Semimanufactures	52	4	West Germany 26; Canada 10.
Platinum-group metals: Metal including alloys, unwrought and partly wrought value, thousands	$13	$3	West Germany $6; Japan $4.
Silver: Metal including alloys, unwrought and partly wrought do.	$75	$24	Sweden $28; Spain $22.
Tin: Metal including alloys:			
Unwrought	154	1	Bolivia 153.
Semimanufactures	9	3	Bolivia 5.
Titanium: Oxides	126	13	France 67; Belgium-Luxembourg 21; West Germany 16.
Tungsten: Metal including alloys, all forms	7	1	Bolivia 5; Brazil 1.
Other:			
Ores and concentrates	5,594	--	Philippines 5,500; Australia 54.
Base metals including alloys, all forms	20	3	Italy 8; Bolivia 5.
NONMETALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc. value, thousands	$723	$341	Mexico $308; West Germany $43; Japan $21.
Dust and powder of precious and semiprecious stones excluding diamond do.	$17	$15	Italy $1; Switzerland $1.

See footnotes at end of table.

Table 3.—Peru: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	Sources, 1982	
		United States	Other (principal)
NONMETALS —Continued			
Asbestos, crude	3,801	551	Canada 2,055; Republic of South Africa 1,193.
Barite and witherite	30	20	West Germany 10.
Boron materials: Oxides and acids	143	106	Do.
Chalk	69	19	France 50.
Clays, crude	6,436	3,981	United Kingdom 1,754; France 476; Japan 146.
Diatomite and other infusorial earth	1,353	488	Mexico 843; West Germany 18.
Feldspar, fluorspar, related materials	134	18	France 65; Italy 51.
Fertilizer materials: Manufactured, ammonia	28	8	Netherlands 11; West Germany 9.
Graphite, natural	11	3	Japan 7; West Germany 1.
Gypsum and plaster	35	22	Japan 13.
Magnesite	2,016	7	Brazil 2,001.
Nitrates, crude	95	--	All from Chile.
Phosphates, crude	41	--	Republic of South Africa 21; France 20.
Salt and brine	2,251	1,836	West Germany 171; United Kingdom 155.
Sodium compounds, n.e.s.:			
Carbonate, manufactured	21,186	17,189	West Germany 1,779; Poland 1,171.
Sulfate, manufactured	2,105	188	West Germany 794; Chile 287; Uruguay 263.
Stone, sand and gravel:			
Dimension stone: Crude and partly worked	457	--	Italy 397; Colombia 60.
Dolomite, chiefly refractory-grade	834	--	All from Spain.
Quartz and quartzite	14	2	West Germany 9; Belgium-Luxembourg 2.
Sand other than metal-bearing	7,122	6,743	Brazil 364; Sweden 15.
Sulfur: Elemental, crude including native and byproduct	920	920	
Talc, steatite, soapstone, pyrophyllite	715	234	Belgium-Luxembourg 123; Italy 113.
Other:			
Crude	915	339	Do.
Slag and dross, not metal-bearing	99	99	
MINERAL FUELS AND RELATED MATERIALS			
Carbon: Carbon black	723	95	Mexico 371; Japan 110.
Coal: All grades including briquets	113,432	24,843	Japan 88,578.
Petroleum refinery products:			
Liquefied petroleum gas 42-gallon barrels	17,342	23	Venezuela 17,319.
Gasoline, motor do	20,171	43	Netherlands Antilles 20,120.
Mineral jelly and wax do	39,555	2,723	Argentina 17,715; West Germany 8,531.
Kerosine and jet fuel do	178	26	United Kingdom 136.
Lubricants do	337,288	121,982	Netherlands Antilles 121,905; Venezuela 63,504.
Bituminous mixtures do	4,339	4,084	Colombia 127; United Kingdom 73.

[1] Table prepared by John G. Panulas. Comparable data for 1981 not available at the time of preparation.

COMMODITY REVIEW

METALS

Cobalt.—The U.S. Trade and Development Program allocated $400,000 to help finance a study on recovering cobalt from pyritic tailings at the Empresa Minera del Hierro del Perú (Hierro Perú) pellet plant near San Nicolás. Solicited bids from U.S. engineering firms were received late in 1983, and Bechtel Inc. was awarded the contract. Several processes have been developed for treating similar low-grade pyritic copper-cobalt concentrates, but all require a higher cobalt market price than that which prevailed during the year. In addition to determining the most economic and technically sound process, the planned study was to include projections of future markets for different processed forms of cobalt.

Copper.—Peru's total copper production fell substantially from the 1982 level, primarily because of lengthy strikes at SPCC's Toquepala (62 days) and Cuajone Mines (47 days), and at the Ilo copper smelter (65 days). SPCC output fell 13% and represented one of its least productive years in the last decade.

At yearend, ore reserves at Toquepala were estimated at about 137 million tons averaging 0.8% copper. At the 1983 level of 25 million tons of ore milled, projected mine life would be about 5 more years. Plans to expand and equip the mine and concentrator for increased amounts of lower grade ore reserves were indefinitely postponed. At the Cuajone Mine, ore reserves were estimated at about 363 million tons averaging 0.9% copper. SPCC continued to evaluate a proposal to increase the Cuajone mill capacity to make up for future ore grade declines.

Minero Perú failed to resolve the problem of negotiating the necessary $130 million loan from Japanese lenders to complete the $298 million Cerro Verde II copper sulfide mining project. The Japanese insisted that the loan be guaranteed by the Peruvian Government, and the Government, bound by the financing limitations, refused. As a result, in September, Minero Perú suspended its engineering contract with Kaiser Engineers International Inc. Kaiser's contract to develop the mine was signed in May 1982, but work could not proceed further without placing orders for needed equipment. Once Minero Perú obtains the necessary financing, it would take almost 3 years to finish the project. Minero Perú continued to negotiate Cerro Verde II financing with the Japanese, as well as with prospective lenders in Austria, Finland, and the Federal Republic of Germany.

Meanwhile, a proposal was announced for keeping the Cerro Verde electrowinning copper cathode plant functioning after the oxide ore is depleted. This proposal involved processing the 11 million tons of 2% copper oxide ore from the Tintaya deposit in the Cerro Verde cathode plant. Production of the underlying sulfide ore at Tintaya was scheduled to begin in late 1984 or early 1985, a few months before the expected mid-1985 depletion of Cerro Verde I oxide ore. It was suggested that Tintaya oxide ore be leached at Tintaya, subjected to an ion-exchange process to produce a copper sulfate solution, and then be shipped in a crystalline form of 25% copper to the Cerro Verde plant for redissolving and electrowinning. This proposal could extend the plant's operation by 4 years.

The Government in 1983 was unable to find investors to assume the 51% available interest in La Empresa Mineral Especial Tintaya S.A. The International Monetary Fund has pushed for such action in order to reduce Peru's financial obligations. The total cost for the Tintaya project was estimated at $327 million. The mine was expected to produce 160,000 tons per year of 33% copper concentrate. Each ton of concentrate also contains 4 troy ounces of silver, 0.14 troy ounce of gold, and quantities of selenium. Overlying the 2% copper sulfide ore that is to be mined are the 11 million tons of 2.18% copper oxide ore that is probably destined for processing at Cerro Verde and 7 million tons of overburden. Copper minerals in the sulfide ore zone are mainly chalcopyrite and bornite extending 300 meters below the surface. In the oxide ore, the principal copper minerals are chrysocolla, malachite, and azurite, ranging in depth from 20 to 80 meters and averaging about 40 meters. Proven sulfide ore reserves were estimated at 34 million tons with a 2.12% copper content and 9 million tons with a lower 0.53% copper content. The life of the open pit mine was expected to be about 13 years at the mill feed rate of 8,000 tons per day.

Minero Perú and Compagnie Française de Mines (Coframines), a subsidiary of France's Bureau de Recherches Géologiques et Minières, were unable to obtain approval from the Peruvian Chamber of Deputies for a joint development of the Tambo Grande polymetallic open pit project near the Ecuadorian border in northwestern Peru. It was expected that approval for the establishment of a special mining company would be forthcoming in 1984. Tambo Grande reserves were estimated at 42 million tons of ore with 2% copper, 1.4% zinc, and 1.2 troy ounces of silver per ton. Initial concentrator capacity was to be 4,000 tons of ore per day.

Ore grades at Centromín Perú's Cobriza copper mine in Huancavelica Department were revised downward from 1.8% to about 1.4%. Proven and probable ore reserves were 32 million tons at a 0.9% cutoff grade. Indicated reserves were estimated at 7 million tons. As a result of the reduced ore grade, the increased concentrator capacity of 9,000 tons per day was expected to produce about 152,800 tons of concentrate per year containing about 39,700 tons of copper. This is about 20% below the originally projected level. The break-even point increased from $1.20 per pound of copper to $1.30, and the financial losses from this project added to Centromín Perú's debt burden. The estimated cost of the Cobriza project was reduced from $261 million to $250 million. According to some mining analysts, Centromín Perú not only erred in its mid-1970's projection of 1982 world copper prices, but the company failed to verify preliminary test drilling assay results that indicated ore reserves grading over 2% copper. When this failed to materialize, ore grades of 1.76% copper were assumed. Exploration for higher grade ore was delayed and so was the project. Centromín Perú's eventual decision to proceed with development resulted in the 1982 commissioning of the concentrator.

A Centromín Perú subsidiary, Cía. Minera Los Montes S.A., opened the Monterrosas copper mine near Ica in 1982. Ore reserves were estimated at 1.3 million tons grading 1.4% copper plus 0.22 troy ounce of silver and 0.02 troy ounce of gold per ton. Ore has been mined at the rate of 1,000 tons per day and presented a serious reserve depletion problem unless exploration found new reserves. In 1983, promising mineralization was found at the Sol Radiante vein in the neighboring Raquel concession. Los Montes may purchase this concession if further exploration proves the preliminary estimate of 800,000 tons of ore grading 3% copper plus some silver and gold content. The company also expected to prove about 700,000 tons of ore present in the Monterrosas East area. Future exploration was planned for the north and south areas of the Monterrosas concession.

Gold.—This precious metal remained a prime exploration target for both local and foreign companies. The southeastern jungle region, especially in the Madre de Dios area, continued to attract miners. Most of the claims were worked by individual gold panners using artisan techniques, although some organized mining company operations employ more sophisticated exploration and recovery techniques. Over 50% of Peru's alluvial gold output is from the Madre de Dios area.

Gold production volumes are of questionable accuracy, especially those for alluvial gold, which account for about one-half of total known production. Mining officials, public and private, have estimated that at least 40% of recovered placer gold is either smuggled out of Peru or is sold illegally within Peru for higher prices than those paid by the Banco Minero. Legally, the Banco Minero has a monopoly on the purchase and marketing of precious metals. To counter smuggling and blackmarketing, the Banco Minero expected to initiate cost reduction programs in order to offer miners better prices for their gold.

Estimated gold production by source, in troy ounces, is shown in the following table:

	1982	1983
In ores and concentrates	9,645	13,278
Refined	69,606	72,867
In placer gravels	r85,296	84,473
Total	r164,547	170,618

rRevised.

In 1983, the Banco Minero exported 166,829 troy ounces of gold valued at $71 million. This represented a 9.6% increase in volume and a 12% increase in troy ounce value over that of 1982.

Aurífera Sur Oriente S.A. (Ausorsa) holds 16 concessions totaling more than 15,000 hectares in the Huaypetue and Puquibe regions, and controls a group of companies owning over 36,000 hectares in the same regions. In 1983, Ausorsa joined with South American Placers Inc. (SAPI) to form Cía. Aurífera Inambari S.A. and Cía. Aurífera Puquibe S.A. The new companies initiated exploration over about 80% of the same territory Ausorsa had explored in 1981 and 1982 with a subsidiary of Rio Tinto Zinc Corp. The Rio Tinto sampling program had found deposits averaging 0.2 gram of gold per cubic meter. SAPI invested $1 million in 1983 exploration work and planned a similar investment for 1984. SAPI is jointly owned by a private Bolivian group, Citicorp Venture Capital Ltd., the Anschutz Corp., and Adela Investment Co.

Texasgulf Perú S.A. continued with the exploration of its concessions on the Lower Inambari and the Madre de Dios Rivers. It invested $2 million during the first 2 years of exploration and planned to continue with drilling and sampling programs during 1984.

Both Minero Perú, owner of the San Antonio de Poto gold deposits in Puno Department, and Centromín Perú, holder of concessions in the Madre de Dios region, restricted their activities during 1983 because of company austerity measures.

Iron Ore.—Hierro Perú was faced with declining sales, partly caused by the continued recession in the world steel industries. Hierro Perú also faced increasing competition from producers in Brazil and Australia, high shipping costs because of the limited San Nicolás facilities, and the declining quality of its iron ore concentrate and pellet production.

Beneficiated iron ore exports totaled almost 4.2 million tons valued at $73 million. This was a 23% decrease in volume and a 32% decrease in value from that of 1982. Sales to the Republic of Korea have increased, and it replaced Japan as the primary importer of Peruvian iron ore concentrate. In 1983, the Republic of Korea accounted for 46% of Peru's iron ore concentrate exports, and Japan, 39%. The Netherlands was the third largest purchaser in 1983, followed by Yugoslavia and Argentina. Iron exports to the United States have declined in recent years, and in 1983 there were none.

Hierro Perú sought $265 million in financing for a 10-year project that would expand mine production to 8 million tons per year by 1992, lower the sulfur content of the concentrate and pellet output to a maximum of 0.4%, develop a soft water supply to reduce impurities in the concentrate and pellets, and increase the capacity of port facilities to accommodate 250,000-deadweight-ton ships and load at the rate of 10,000 tons per hour. Almost 60% of the proposed investment would be for new equipment.

Production by category for 1982-83 is shown in the following table, in thousand metric tons:

	1982	1983
Pellets	1,422	1,063
Low-silica pellets	60	38
High-grade sinter feed	2,893	2,403
Pellet feed in slurry form	171	39
Pellet feed in cake form	1,193	751
Oxide ore	35	53
Total	5,774	4,347

Iron and Steel.—The troubled state-owned company, Siderperú, restarted its steelmaking operation on January 4, after 127 days of shutdown owing to depressed market conditions and excess levels of inventory stock. During the same month, Peru's coastal area, including Chimbote, was hit by torrential rains and suffered from power failures, flooding, and landslides. Damage to the Chimbote area was estimated at $2.5 million, and the steel plant was practically inoperative for 2 weeks.

The Siderperú plant operated at about 41% capacity in 1983, and produced about 210,000 tons of steel, down from the 246,000 tons produced in 1982. Peru's total steel production increased because of the January initiation of production from the new privately owned, 140,000-ton-per-year capacity ministeelworks of Empresa Laminadora del Pacífico S.A., at Pisco, south of Lima.

The new steel plant produced far under capacity as it faced the same weak market demand as Siderperú. It competed aggressively for product sales and captured about one-third of the internal market. Only one of its two 40-ton electric furnaces operated, and the company produced about 68,000 tons of steel in 1983. Output for 1984 was projected at 100,000 tons. If operating at maximum efficiency, the company believed it could easily reach or surpass capacity. However, given the serious fluctuations in electrical power available in the Pisco region, the company probably could not produce at capacity without some corrective measures.

The Ministry of Economy and Finance assumed Siderperú's $52 million debt with the Banco de la Nación. Siderperú was also authorized to capitalize its $8.5 million tax obligation to the treasury. In return, Siderperú was to issue stocks on behalf of the Ministry of Economy and Finance holding company, Corporación Financiera de Desarrollo (COFIDE).

The Government allowed Siderperú funds to support a $50 million credit under negotiation with the International Bank for Reconstruction and Development (World Bank). The loan was for modernization work, including an upgrading of the electric furnaces to allow the blast furnaces to be shut down. Fifteen international firms were invited to bid on the project.

Lead and Zinc.—Minero Perú's Cajamarquilla zinc refinery produced an estimated 89,762 tons, down about 3% from that of 1982. Sabotage damage to the plant's electrical supply source during July caused some disruption in production and shipments but was of short duration. The refinery also produced 293 tons of cadmium, 849 tons of copper cement, 12,165 tons of lead-silver residues, and 169,476 tons of sulfuric acid.

At its La Oroya metallurgical complex,

Centromín Perú produced about 64,268 tons of refined electrolytic zinc and 67,734 tons of refined lead. In November, Centromín Perú brought its new $61 million lead sinter plant into production. The sinter is formed by heating lead concentrate, which in turn is used for smelting and then refining lead. The new plant is highly automated and equipped with pollution control devices. Centromín Perú's refined lead output had been declining in recent years because of the inefficiency of the old sinter plant. Refined lead production was expected to return to the designed capacity of 95,000 tons per year when the new sinter plant is operating at capacity. An increased recovery of more than 2 million troy ounces of silver per year was expected because of the greater roasting capacity of the new plant and the new dust recycling system.

Fundición de Concentrados S.A. expected to bring its new lead refinery on-stream by the end of 1984. The plant was under construction at Sayán, about 45 kilometers east of Huacho in Pasco Department. The privately owned plant was designed somewhat similar to Centromín Perú's new plant, but on a smaller scale. The concentrate treatment capacity of 24,000 tons per year was expected to produce 10,000 to 12,000 tons of refined lead and 40 to 42 tons of refined silver in bars. At first the plant was to treat concentrate from Cía. Minera Santa Rita S.A., the major shareholder, but later on was expected to add concentrates from small producers. Marketing negotiations were underway with Minpeco.

Cía. Minera Milpo S.A. became the largest private sector lead producer in 1983, overtaking Cía. Minera Atacocha S.A. Milpo's lead concentrate output increased 30% over that of 1982 and contained an estimated 18,300 tons of lead. Zinc concentrate production increased 24% and contained about 31,400 tons of zinc. Silver contained in concentrates reached about 2.7 million troy ounces, more than a 107% gain over that of 1982.

Atacocha was upgrading its mine, concentrate plant, and electrical power system in a $5 million program expected to be completed by mid-1984. The expansion project would increase aggregate output by 20%. In 1983, lead contained in concentrates amounted to about 13,500 tons, zinc in concentrates was 18,800 tons, and silver in concentrates was slightly more than 1 million troy ounces. The company engaged in exploration to increase ore reserves and justify further concentrator expansion to 2,200 tons per day from the present expansion to 1,800 tons per day. The opening of a new zinc mine in the Santa Barbara area was under consideration. This mine would be adjacent to present operations. The major part of Atacocha's production has been sold through Mauricio Hochschild & Cía.

Sociedad Minera Gran Bretaña S.A. produced about 16,500 tons of zinc contained in concentrate from its Azulcocha Mine in Junín Department. The company had planned to open its lead-zinc-silver Contonga Mine in Ancash Department during 1983, but problems arose with financing the $14 million project. Funding was finally obtained from COFIDE, Banco Minero, and other local banks. The mine opening was rescheduled for mid-1984. The Contonga concentrator capacity was planned for a first stage level of 500 tons per day, increasing to 1,000 tons per day early in 1985, after an additional $1 million investment. Output from Azulcocha continued to be sold through Minpeco based on a contract that expires at the end of 1985. Production from the new Contonga Mine was expected to be sold through the spot market until purchase agreements are made with one or more buyers.

Cía. Minera San Ingacio de Morococha S.A. (SIMSA) continued to make improvements at its San Vincente Mine at San Ramón in Junín Department. SIMSA, with 1983 production at 60,338 tons of zinc contained in concentrates, was the largest private producer. The company projected 1984 output to increase by 20% through the completion of its Uncush tunnel for transporting ore from the mine to a remodeled concentrator. Concentrate grade was expected to increase from 58.8% to 62% zinc. A new primary grinding circuit was scheduled for completion in 1984. The new magnesium leaching plant came on-stream in September 1983 and should improve concentrate quality. SIMSA's production costs were about $16 per ton, not including financing and selling costs.

Silver.—Peru's total silver production was placed at more than 55.8 million troy ounces, a 9% gain over the 51.3 million troy ounces for 1982. The gain was attributed to increases by medium-size mines. They accounted for 32.9 million troy ounces in 1983, or 28% more than that of 1982.

Cía. de Minas Buenaventura S.A. maintained its position as the largest privately owned silver producer and increased output from 6 million troy ounces in 1982 to more than 7 million troy ounces. In 1982, silver represented more than 93% of Buenaventura's sales, but this fell to about 87% in 1983 because of the substantial increase in Buenaventura's gold production. All three of Buenaventura's mining units, Uchucchacua, Julcani, and Orcopampa, increased silver output, but the latter mine made the most significant gain with an increase of about 600,000 troy ounces. The recent discovery of the Calera ore body at Orcopampa has increased reserves at this mining unit to over 1.3 million tons containing 17 troy ounces of silver per ton. In January 1984, the Orcopampa unit was scheduled to be formed into a separate company, Cía. de Minas Orcopampa S.A. Buenaventura has long-term contracts for direct sales to smelters of Centromín Perú, ASARCO Incorporated of the United States, Noranda Mines Ltd. of Canada, Norddeutsche Affinerie AG of the Federal Republic of Germany, and Société Minière et Métallurgique de Peñarroya of France.

Refined silver from Centromín Perú's La Oroya metallurgical center was 21.7 million troy ounces, a 12% decrease from that of 1982. This was attributed to production and transportation interruptions caused by flooding and a 22-day strike. The new lead sinter plant was expected to increase 1984 silver recovery through its dust recycling system. From its own mines, Centromín Perú produced 11.7 million troy ounces of silver in concentrates, a 4% increase over that of 1982.

Minas de Arcata S.A., the second largest private silver producer, increased production by almost 3%, to 3.1 million troy ounces. Arcata reduced total direct costs by 20%, to $6 per troy ounce of silver produced, because of austerity measures and the operation of the new 3.8-megawatt Misapuquio hydroelectric plant. A $6 million expansion to 800 tons per day ore capacity was scheduled for completion in September 1984. Proved and probable ore reserves in Arcata's Cayarani-Arequipa deposits were estimated at just over 2 million tons grading 15.2 troy ounces of silver per ton.

In 1983, Arcata obtained exploration rights to 250,000 hectares of mining claims in the Departments of Arequipa, Apurimac, and Cuzco. Arcata, with an option for as much as 85% participation in any resultant mining venture, planned to invest $3 million in this project, named "Huanzo."

Other major silver producers also recorded increases in production, except SPCC, which had lower silver output because of reduced copper mining at Cuajone.

An upturn in the world market price for silver began in mid-1982, but was not sustained and began a steady decline in the third quarter of 1983, ending the year at less than $9 per troy ounce. Nevertheless, many of Peru's producers were planning or completing expansions and other programs to increase output and decrease costs. Silver exports accounted for more than 13% of total export earnings and not only enabled most producers to end the year profitably, but also lessened Peru's balance-of-payments problem.

Tungsten.—Despite low market prices, output increased slightly over the record high 1982 production. Peru's largest tungsten producer, Fermín Málaga Santolalla e Hijos Negociación Minera S.A., began to stockpile concentrate rather than sell at what, by December, was estimated to be the lowest market price since 1965.

Málaga Santolalla's Pasto Bueno Mine in Ancash Department had labor problems during the year, but still produced 631 tons of concentrate, containing almost 75.2% WO_3. Production from Centromín Perú, the second largest producer in 1982, fell substantially in 1983. This was because of reduced output at both the Morococha unit and the Mahr Tunnel tungsten plant at the San Cristóbal unit.

Cía. Minera Puquio Cocha S.A. continued to recover 69% tungsten concentrate from its mine tailings in the central highlands.

Tungsten production by company was as follows, in metric tons of WO_3 content:

	1980	1981	1982	1983^{e}
Málaga Santolalla	296	358	397	475
Minera Regina	145	200	187	196
Centromín Perú	209	130	239	158
Other^{e}	50	50	45	83
Total	700	738	868	912

^{e}Estimated.

MINERAL FUELS

Coal.—Empresa Promotora de Carbón S.A. (Procarbón), through its evaluation studies of existing coal deposits, estimated Peru has more than 914 million tons of coal reserves. The estimate was based on tentative evaluations of 39 deposits located in the Departments of Tumbres, Cajamarca, La Libertad, Ancash, Huanuco, Pasco, Lima, Junín, Arequipa, and Moquegua.

The Inter-American Development Bank agreed to finance a three-stage development of Peru's coal industry: (1) estimate Procarbón's financial needs, (2) provide nonreimbursable funding for the coal studies, and (3) finance specific coal projects. The first stage was undertaken in 1983. Procarbón estimated the cost for each coal basin preliminary study at $425,000. Also in 1983, Procarbón contacted several foreign governments for technical cooperation agreements to develop projects such as Carumas in Moquegua and Jatunhuasi near Huancayo.

Work continued on the Alto Chicama deposit, in northern Peru's Trujillo Province, La Libertad Department. This coal deposit was expected to fuel a 300-megawatt electric powerplant and augment present electrical capacity in the area. The plant would serve as a pilot or model for planning similar projects in other areas containing coal deposits. This project was to be financed by a private consortium selected by bidding.

The Oyón coal deposit was assigned to Siderperú for development and company use. Exploration and analytical studies have been carried out by Siderperú since 1977, and by 1983, about 2 million tons of reserves were identified. Study results have so far determined that in addition to the deposits of coking coal, the area contains a large volume of noncoking coal that may be developed by Procarbón with private financing.

The Oyón coal has a low volatile content and was determined to be more reactive and a better reducer than anthracite. This enhances its application in the direct-reduction process. The coal is friable and a special process is used that decreases fine particulate loss during mining and hauling. An initial test of 200 tons was shipped to the pilot sponge iron plant in Chimbote. If the test proved favorable, additional shipments were to be scheduled. Siderperú's direct-reduction plant requires about 72,000 tons of coal per year.

Petroleum and Natural Gas.—Petroperú's repeated warnings that some stimulus was needed to attract increased foreign investment became more urgent as the crude oil reserves estimate for the end of 1983 fell by 8% to 716 million barrels. A further 6% decline was projected for 1984. Drilling activity included 15 wildcats in 1983, and only 13 exploratory wells were planned for 1984.

Some Government officials have acknowledged that Peru is faced with the prospect of becoming a net importer of crude oil by 1986 or 1987. In an effort to encourage exploration, the Government in 1983 eased new contract terms to allow a company to take a seismic option, whereby it would not be required to drill two wildcats during the first 2 years of exploration if the seismic survey was unfavorable. The exploration companies had complained that contract requirements did not allow sufficient time to study seismic data, and this inflexibility increased the probability of dry holes. In other action, the Government extended the acreage open to companies already exploring in Peru. Occidental and the Royal Dutch/Shell Group began negotiations to acquire additional blocks.

The two Government conciliatory gestures mentioned above were generally not considered sufficient by the concerned international oil firms operating in Peru, and they continued to push for modifications to present oil legislation. They wished to ease the process of approving exploration contracts. A contract negotiated with Petroperú must subsequently be approved by seven Government entities: the Consejo de Ministros, the Ministerio de Energía y Minas, the hydrocarbons office, the customs office, the joint command of the armed forces, the Banco Central, and the tax office. The latter two entities have reportedly required the most time for contract review. The companies also wanted to obtain more flexible exploration scheduling, improved contract terms, and a restructuring of the various tax systems. The Government issued new regulations on December 31, 1983, which authorized the oil companies to revalue assets in line with devaluation. This was expected to help the companies in cost recovery.

Petroperú negotiated with Union Texas Petroleum Corp. and Texaco Inc. for acreage in Block 6, with Royal Dutch/Shell for a seismic option in Block 49 near the Bolivian border, and with Occidental for acreage in the Huallaga Basin area of Blocks 29 and 30. Final agreements on the new contract areas may depend on incentives offered by the Government. Petroperú received a $20 million loan from the Inter-American Development Bank to help finance a $50 million seismic and geochemical study of Block 8 in the northern jungle and Blocks 31 and 35 in the central jungle area. Negotiations continued with Hispánica de Petróleos S.A.

(HISPANOIL) for Block 50 in the northern jungle.

Torrential rains along the northwestern coast from mid-January through May caused flooding and mudslides that damaged Petroperú's north coastal Talara operations. Not only was there severe infrastructural damage to buildings, roads, water supply systems, electrical systems, pipelines, and the 65,000-bbl/d Talara refinery, but the weather also prevented well workovers and maintenance activities. The transandean pipeline was inoperative for 14 days and caused production from the northern jungle fields to be curtailed. The Occidental-Bridas secondary recovery waterflood project at Los Organos in the Talara area was also disrupted by the weather and suffered major damage. Production from the field averaged 14,000 bbl/d compared with almost 19,000 bbl/d in 1982. The damage was not permanent, and Occidental expected production to return to past levels.

Petroperú planned a $241 million exploration and development program for the Laguna-Zapotal secondary recovery project in the Talara area. The project was to be partly funded by an $82 million loan from the World Bank and a $25 million credit line from Argentina. A $20 million, 4-year contract was awarded to the Argentine firm Cía. Naviera Perez Companc S.A. for project management and included a production bonus. Project plans included 159 new wells to be drilled and 177 wells to be worked over.

Belco offshore operations also suffered from the poor weather that prevailed during the first half of 1983. The company continued exploration drilling in Blocks Z-1 and Z-2.

Superior Oil Co. drilled a second dry hole in its Block 2 northeastern jungle concession. Both this well and the one drilled in 1982 reached depths approaching or exceeding 17,000 feet. Superior spent about $70 million in its 2-year exploration effort. By midyear 1983, the company decided to leave Peru despite a 6-month contract extension granted by the Government to allow time for an evaluation of data.

Occidental was faced with declining production from its northern jungle fields. Well workovers and improved pumps were installed to increase recovery rates. Output during the year averaged 89,000 bbl/d, including that from two newly developed fields, the Jíbaro and the Jibarito. Development work on the Shiviyacu Field was also completed. The company's new exploration efforts were limited in scope and reportedly unsuccessful. Occidental applied for concessions in Blocks 29 and 30 in the Huallaga River Basin of the central jungle area, west of Petroperú's concession area. Occidental was also studying various engineering techniques to develop 1.5 billion barrels of heavy oil in its Block 1-B northern jungle concession. The company estimated about a 10% recovery rate.

Hamilton International Oil Co. del Perú and Petroinca S.A. drilled a wildcat at Pastococha on their Block 7 concession. The 14,160-foot well flowed at about 600 bbl/d of 26° API crude oil. Hamilton considered the well to be subcommercial. Petroinca, a 10% partner in the venture, decided to continue testing the well at its own expense. It expected to bring the well into production and ship the oil by barge to Petroperú's refinery at Iquitos. A second well drilled by the partnership at Viracocha was dry, and Hamilton, after spending $33 million in a 2-year exploration program, was considering withdrawing from Peru.

In the southern jungle area, Royal Dutch/Shell drilled a dry hole near the Urubamba River in Block 38. A second well was spudded 100 kilometers to the south in Block 42. This well produced at the rate of 18 million cubic feet of gas and about 560 bbl/d of oil. Shell Oil Co. considered the discovery encouraging and was reviewing alternatives for future action. Phillips Petroleum Corp. finally obtained Government approval of its 1982 agreement with Shell for a 30% partnership in the venture.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Peruvian soles (S/) to U.S. dollars at the 1983 average exchange rate of S/1,632.05 = US$1.00.

The Mineral Industry of the Philippines

By John C. Wu[1]

The Philippines remained one of the top 10 world producers of copper and gold and an important producer of chromium, nickel, and cobalt in 1983.

Because of the slow recovery in the world metal market and the financial difficulties in the Philippine economy, the activities of the mining industry remained dull. Many idle mines in the 1981-82 period remained closed or did not resume operations because of a shortage in capital and foreign exchange to import essential equipment and spare parts.

Projects for expansion and new mine developments were carried out only by Atlas Consolidated Mining and Development Corp. for the Second Lift copper project at its Lutopan deposit near Toledo in Cebu and by Benguet Corp. for development of new refractory-grade chromite ore bodies near its Coto deposit at the Masinloc Mine in Zambales.

In early 1983, the Construction and Development Corp. of the Philippines (CDCP) was taken over by the Government to prevent the company from bankruptcy, while a financial rescue operation for Marinduque Mining and Industrial Corp. (MMIC) was under serious consideration throughout the year. The Government reportedly has granted an exemption of all taxes, fees, and charges to MMIC until 1988.

The financial status of the Philippine mineral industry was still far from complete recovery in 1983. Among the major mining companies, only Philex Mining Corp. and Benguet were strong and profitable, while several major mining companies have gone further into heavy debt. Because of the importance of the mining industry in the Philippine economy, the Government, through the National Development Co. (NDC), extended its copper subsidy program to copper producers from February to April 1983.

As a result of the Government assistance and slight recovery of copper and gold prices, the performance in copper and gold mining industries improved slightly. However, mining activities in chromium, nickel, cobalt, molybdenum, lead, and zinc remained stagnant.

After the completion of eight coal conversion projects in the Philippine cement industry, the output of cement rose by 12% in the first quarter of the year and was expected to reach 5 million tons for the year. Because of a lack of financing, the first 1-million-ton-per-year cement plant to be built at Basay in Negros Oriental by Negros Cement Corp. was canceled.

In the mineral fuel sector, progress was made in coal mining and offshore petroleum production. A record-high coal production of 1 million tons was expected in 1983 as a result of increased demand from cement, mining, and mineral processing industries. Crude petroleum output from offshore oilfields reached 5 million barrels because two additional oilfields came on-stream in late 1982.

In the mineral processing sector, the Philippines' first copper refinery was officially inaugurated in Leyte in June. The first year output of refined copper was successfully marketed in Japan. In January, the Philippines also officially commenced operations of its second ferrochromium plant on Mindanao Island. The high-carbon ferrochromium produced by the plant was exported to Japan.

The Philippine copper refinery uses geothermal energy, and the ferrochromium plant uses hydroelectric power. The use of cheap energy made these two processed minerals competitive in the world market.

In an effort to go downstream further in copper, the Philippines established ASEAN Copper Products Inc. to build a 100,000-ton-per-year copper fabricator adjacent to the new copper refinery in Leyte. The fabricator was scheduled for completion in 1987.

Despite the slow recovery of the mining and quarrying industry, the industry became more important to the Philippine economy because of its increasing contribution to the country's export earnings as well as employment.

According to the Philippines National Economic Development Authority, the real gross domestic product grew only 1.4% in 1983 compared with 2.8% (revised) in 1982. The severe drought in many parts of the country and the unfavorable financial developments in the latter part of the year prevented the country from achieving the target of 6.5% growth in the economy.[2]

During the year, private consumption grew by 3.1%. However, this growth was offset largely by a 0.7% negative growth in Government expenditures and a 4.4% negative growth in gross domestic capital formation. Because of the Government budgetary cutback, public construction projects declined 21.5%. Philippine exports dropped 3.2%, and imports declined 2%.

As a result of the continued high level of imports and a drop in exports, the Philippine overall balance-of-payment deficit rose to $2.9 billion in 1983 from $1.1 billion in 1982. The balance of merchandise deficit remained at about $2.6 billion.[3] To correct the imbalance of the balance of payment, the Central Bank of the Philippines announced further devaluation of the Philippine peso (₱) by 21.4% against the United States dollar from ₱11 to $1.00 to ₱14 to $1.00 in October. The Central Bank also presented a seven-point package, which included a renewed export effort, energy conservation, domestic substitution of imports, continued review of capital-intensive investments, austerity programs in the public and private sectors, and police action against smuggling.

To encourage exports, a new investment incentive law, known as the Investment Incentive Policy Act of 1983, was signed by the President of the Philippines in April. The law was to grant more incentive to local and foreign firms that are export-oriented. The new incentive included granting up to a 10% tax credit on the net value earned and on the net local content of export values. The law lays emphasis on increased productivity of the land, such as minerals and aquatic and other resources.

To discourage imports in 1983, the Government imposed an additional 3% ad valorem tax on all imports. In addition, importation of capital goods, including machinery, equipment, and spare parts, was restricted with an aggregate value of $50,000 or more within any one calendar month providing the proposed imports are covered by suppliers' credit or financed by the Asian Development Bank and/or the International Bank for Reconstruction and Development (World Bank).

In December, a new law was signed and put into effect by the President, concerning foreign investments in the Philippines. The President's Decree No. 1892 authorized foreign businessmen to invest up to 100% in the so-called nonpioneer enterprises. Foreigners may increase their equity under the old 60-40 (60% domestic and 40% foreign equity) provision up to 100%. However, they may not engage in activities reserved by the Constitution and existing laws for local citizens and juridical entities owned by Filipinos.

Because of Philippine financial difficulty in foreign exchange, the Central Bank encouraged vital industries to accept foreign equity investments in the form of raw material, supplies, and capital goods needed to sustain their operations. The guideline, known as the CB No. 4, was issued in November by the Central Bank.

Despite all the efforts by the Government in dealing with the country's financial crisis, the Philippines' external debts continued to increase. In 1983, the total external debt was estimated at $24.6 billion by the Central Bank. In addition to this total outstanding foreign debt, there were $1.6 billion of contingent and other liabilities in guarantees and foreign banks' standby line of credits extended mostly to Philippine construction projects overseas in unconfirmed regular line of credits, and in leverage lease by Philippine Airlines. By yearend, negotiations on the restructuring of some external debt and a new commercial loan of $1.65 billion were conducted between the Philippine Government and the International Monetary Fund, the World Bank, the Asian Development Bank, and a 12-bank advisory committee representing about 350 commercial bank creditors.

PRODUCTION

Philippine mineral production recovered moderately as the metal prices in the world market improved in 1983. In 1982, the value of metallic mineral production dropped 15.5% while the value of nonmetallic production rose by 26.8%. As a result, the value of overall mineral production declined only by 3%. Copper, gold, and cement alone contributed 29.2%, 21.5%, and 21.4%, respectively, to the total value of Philippine mineral production in 1982.

Despite additional shutdowns of copper mines in 1983, mine production of copper and gold increased. Higher prices of copper and gold and devaluation of the Philippine peso were the main factors cited by the industry for the increase in production. Other mine production of metallic minerals such as chromium, nickel, cobalt, lead, and zinc remained stagnant because of the restructuring of operations and low prices of the metals.

The Philippines took a major step in downstream mineral processing. Ferrochrome Philippines Inc. started production of its 50,000-ton-per-year ferrochromium plant on Mindanao Island in April while the Philippines Associated Smelting and Refining Corp. (PASAR) began production at its 138,000-ton-per-year copper refinery in southern Leyte in July. Operations of both plants were expected to reach near capacity in 1984.

In the mineral fuel sector, the output of coal continued to increase and reached 1 million tons in 1983. The output of crude oil from Nido Oilfield continued to drop. However, because two additional oilfields—Panadan and Libro, near Matinloc—were put into production, the overall crude production jumped by over 60%.

Table 1.—Philippines: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Chromium: Chromite, gross weight:					
Metallurgical-grade	167,785	160,961	156,237	142,186	119,200
Refractory-grade	388,325	335,099	283,019	178,948	165,200
Total	556,110	496,060	439,256	321,134	284,400
Cobalt, mine output, metal content	1,370	1,331	997	466	530
Copper:					
Mine output, metal content	298,300	304,504	302,328	292,086	308,800
Metal, primary	--	--	--	--	40,000
Gold troy ounces	535,166	643,806	753,451	834,439	801,700
Iron and steel:					
Iron ore and concentrate thousand tons	6	--	6	6	2
Ferroalloys:					
Electric-furnace ferrosilicon[e]	18,000	20,000	22,400	27,500	20,000
Electric-furnace ferrochromium[e]	10,000	10,000	10,000	12,000	21,500
Steel, crude thousand tons	397	330	350	350	350
Lead, mine output, metal content	1,949	1,812	1,066	--	--
Manganese ore and concentrate, gross weight	3,769	2,556	3,113	1,556	1,540
Molybdenum, mine output, metal content	141	91	94	80	70
Nickel:					
Mine output, metal content	33,287	47,571	29,247	19,634	19,000
Metal, smelter	21,478	25,881	21,485	11,485	9,500
Silver, mine output, metal content thousand troy ounces	1,838	1,952	2,024	1,984	2,000
Zinc, mine output, metal content	9,670	6,845	5,289	3,003	2,200
NONMETALS					
Asbestos	--	6	--	--	--
Barite	6,667	5,355	2,135	8,697	2,630
Cement, hydraulic thousand tons	3,950	4,481	4,090	4,350	5,000
Clays:					
Bentonite	3,123	5,053	5,527	4,671	5,000
Red	24,126	31,561	6,613	400	1,000
White	402,241	15,232	10,583	6,632	10,000
Rock	1,393	1,039	613	390	500
Other	428,639	453,494	571,386	579,229	570,000
Feldspar	19,064	15,925	15,999	15,213	15,000
Gypsum and anhydrite:					
Natural	--	--	412	202	200
Synthetic[e]	110,000	110,000	110,000	110,000	110,000

See footnotes at end of table.

Table 1.—Philippines: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982^{p}	1983^{e}
NONMETALS —Continued					
Lime	53,887	87,363	84,837	66,349	70,000
Nitrogen: N content of ammonia	^{e}40,400	39,100	32,400	^{e}14,800	20,300
Perlite	3,806	7,973	7,530	3,580	4,000
Phosphate:					
Guano	3,158	24,836	2,055	15,259	3,000
Phosphate rock	2,495	17,679	8,413	5,944	10,000
Pyrite and pyrrhotite (including cuprous), gross weight	87,408	115,231	97,872	64,555	69,000
Salt, marine	322,131	346,387	355,289	364,420	381,900
Sand and gravel:					
Alumina sand	26,547	25,979	33,513	65,213	60,000
Silica sand thousand tons	407	478	472	480	350
Other[3] thousand cubic meters	11,132	13,310	13,319	14,902	15,000
Stone:					
Andesite	276,221	231,872	22,484	334,915	200,000
Basalt cubic meters	421	--	602,529	737,365	700,000
Dacite	18,136	10,636	30,047	54,555	40,000
Diorite	112,319	86,800	77,782	56,215	60,000
Dolomite	10,375	11,318	90,095	353,342	300,000
Limestone[4] thousand tons	10,156	10,098	10,676	7,208	10,000
Marble (dimension), unfinished cubic meters	5,966	9,288	6,753	6,797	7,000
Volcanic cinder do	827	2,651	1,050	1,100	1,000
Sandstone	47,006	57,467	36,593	32,616	35,000
Serpentine	7,579	23,571	9,040	515	600
Tuff	106,327	132,721	122,788	81,008	100,000
Quartz	39,298	61,533	45,282	84,866	40,000
Crushed, broken, other[5] thousand cubic meters	1,908	1,687	1,489	1,031	1,500
Sulfur: S content of pyrite	40,645	53,583	45,511	30,018	32,000
Talc	3,570	863	446	1,008	1,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, all grades	263,132	325,008	318,170	556,755	1,140,000
Petroleum:					
Crude thousand 42-gallon barrels	8,570	3,620	2,500	3,000	4,800
Refinery products:					
Gasoline do	14,632	11,751	9,654	9,242	NA
Jet fuel do	2,174	2,270	2,184	2,858	NA
Kerosine do	4,055	3,620	3,152	3,142	NA
Distillate fuel oil do	16,532	17,204	16,361	16,362	NA
Residual fuel oil do	29,278	27,333	26,460	24,462	NA
Other do	3,002	3,421	3,251	8,737	NA
Refinery fuel and losses do	3,536	3,203	3,114	3,197	NA
Total do	73,209	68,802	64,176	68,000	NA

^{e}Estimated. ^{p}Preliminary. NA Not available.

[1] Table includes data available through June 12, 1984.

[2] In addition to the commodities listed, the Philippines produces platinum-group metals as byproducts of other metals, but output is not reported quantitatively, and no basis is available to make reliable estimates of output levels.

[3] Includes "pebbles" and "soil" not further described.

[4] Excludes limestone for road construction. Reported figures are as follows, in cubic meters: 1979—9,687 (revised); 1980—9,741; 1981—24,092; 1982—30,697; and 1983—not available.

[5] Includes materials described as rock, crushed or broken; stones, cobbles, and boulders; rock aggregates; and broken adobe.

TRADE

Philippine total export earnings dropped to $4.8 billion in 1983 from $5 billion in 1982. Decline in export earnings was reported not only in mineral commodities but also in most of the major commodities such as electronics (semiconductors), garments, sugar, coconut oil, and wood products. Among the mineral commodity exports, copper and gold contributed about 6.5% and 4%, respectively, to total export earnings. Japan and the United States were the major buyers of Philippine copper and gold, followed by the Republic of Korea and Taiwan. The Philippines reportedly also exported about 50,000 tons of refined copper to Japan.

Philippine total imports also dropped slightly to $7.5 billion. Imports of petroleum and petroleum products accounted for 30% of the total imports, and base metals, 6%. Other major imports were nonelectrical machinery, electrical machinery, and transport equipment.

Among the Philippine trade partners, the United States accounted for 23% of Philippine imports and 34% of the total exports; Japan accounted for 18% of Philippine imports and 21% of the total exports. Philippine trade with the European Economic Community (EEC) improved owing to the EEC's increased imports from the Philippines while Saudi Arabia and Kuwait continued to be the major suppliers of Philippine petroleum and petroleum products.

Table 2.—Philippines: Exports and reexports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Unwrought	10	18	--	All to Hong Kong.
Semimanufactures	2,879	4,605	--	Indonesia 4,007.
Chromium: Ore and concentrate	397,382	279,017	37,653	Japan 105,661; China 75,361; Sweden 24,413.
Copper:				
Ore and concentrate thousand tons	r1,139	1,060	43	Japan 787; Republic of Korea 130; China 55.
Matte and speiss including cement copper	9	20	--	All to United Kingdom.
Metal including alloys:				
Scrap	1,207	621	--	Japan 561; India 37.
Unwrought	1	--		
Semimanufactures	r35	6	--	Singapore 4.
Gold:				
Concentrate, gross weight	--	120	--	All to Japan.
Waste and sweepings troy ounces	1,036	--		
Metal: Contained in copper concentrates do.	475,825	472,807	53,982	Japan 347,521; Republic of Korea 34,336; China 25,367.
Iron and steel:				
Iron ore and concentrate: Pyrite, roasted	35,408	18,422	--	All to Taiwan.
Metal:				
Scrap	1,411	1,582	2	Japan 840; Taiwan 717.
Ferroalloys:				
Ferrosilicon	25,582	28,364	--	Japan 26,980; Indonesia 1,384.
Unspecified	5,686	4,219	--	Japan 3,906; Indonesia 313.
Steel, primary forms	15,250	--		
Semimanufactures:				
Bars, rods, angles, shapes, sections	1,399	866	2	Singapore 554; Malaysia 174.
Universals, plates, sheets	5,143	249	--	All to Hong Kong.
Hoop and strip	1	--		
Wire	--	46	--	Do.
Tubes, pipes, fittings	2,145	151	--	Brunei 84; Hong Kong 38; Singapore 16.
Castings and forgings, rough	1,318	794	386	Australia 248; Saudi Arabia 114.
Lead: Ore and concentrate	1,801	--		
Manganese: Ore and concentrate	2,800	--		
Mercury 76-pound flasks	--	881	881	
Molybdenum: Ore and concentrate	139	155	42	Chile 112.
Nickel:				
Ore and concentrate	557,583	408,712	--	All to Japan.
Metal including alloys:				
Scrap	22	61	--	Japan 45; United Kingdom 15.
Unwrought	15,469	5,869	1,100	Japan 2,715; Netherlands 2,050.
Semimanufactures	2,660	5,032	1,528	Netherlands 3,373.
Silver:				
Waste and sweepings troy ounces	3,762	--		
Metal including alloys, unwrought and partly wrought do.	13,105	121,403	--	Hong Kong 65,700; United Kingdom 55,703.
Tin: Metal including alloys, all forms	252	66	19	Japan 45.
Zinc:				
Ore and concentrate	11,873	3,989	--	All to Japan.
Metal including alloys, all forms	415	149	--	Japan 100; China 22.

See footnotes at end of table.

Table 2.—Philippines: Exports and reexports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Other:				
Ores and concentrates	[r]1,108	408	--	All to Japan.
Ashes and residues	2,876	3,952	--	Japan 3,445; Taiwan 467.
Base metals including alloys, all forms	[r]411	352	15	Japan 264; Hong Kong 49; Taiwan 15.
NONMETALS				
Barite and witherite	--	5,516	--	All to Brunei.
Cement	492,734	571,683	--	Indonesia 192,712; Bangladesh 114,450; India 101,572.
Fertilizer materials: Manufactured:				
Ammonia	2	--		
Nitrogenous	[r]50	--		
Precious and semiprecious stones other than diamond: Synthetic carats	--	395,000	--	All to Switzerland.
Stone, sand and gravel:				
Dimension stone	6,116	8,714	585	Taiwan 2,793; Japan 2,500; Hong Kong 1,301.
Dolomite, chiefly refractory-grade	29,467	316,337	--	All to Japan.
Gravel and crushed rock	7,877	6,423	8	Japan 5,745; Hong Kong 443.
Limestone other than dimension	24,100	21,034	--	Australia 21,000.
Other:				
Crude	1,586	3,025	--	Taiwan 2,706; Australia 160.
Slag and dross, not metal-bearing	1,198	800	--	Japan 600; West Germany 200.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	6,000	--		
Carbon: Carbon black	774	65	--	All to Hong Kong.
Coal: Anthracite and bituminous	6,800	1,155	--	All to Taiwan.
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	350,796	38,976	--	Japan 13,340; Australia 11,716; Thailand 11,020.
Gasoline do	[r]785,307	286,261	--	Republic of Korea 194,276; Japan 80,588.
Kerosine and jet fuel do	--	4,890	--	All to Pacific Islands Trust Territory.
Distillate fuel oil do	--	42,067	--	Do.
Lubricants do	29,722	15,939	--	Republic of Korea 4,494; Singapore 3,038; Tanzania 2,408.

[r] Revised.

[1] Table prepared by Audrey D. Wilkes.

Table 3.—Philippines: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	3	17	16	Australia 1.
Aluminum:				
Ore and concentrate	12,592	3,762	--	Malaysia 2,543; China 1,200.
Oxides and hydroxides	1,394	644	106	Japan 437.
Metal including alloys:				
Scrap	222	82	25	Hong Kong 44.
Unwrought	10,406	18,472	539	Australia 8,928; France 2,773; New Zealand 1,986.
Semimanufactures	4,446	13,604	1,745	Japan 4,337; West Germany 1,177; Norway 1,154.
Arsenic: Oxides and acids	162	218	18	United Kingdom 82; Belgium-Luxembourg 43; France 36.
Chromium:				
Ore and concentrate kilograms	--	300	--	All from Japan.
Oxides and hydroxides	70	51	8	Japan 21; West Germany 12.
Cobalt: Oxides and hydroxides	5	29	(2)	Australia 27.

See footnotes at end of table.

Table 3.—Philippines: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Copper:				
Sulfate	175	344	30	West Germany 136; Belgium-Luxembourg 72; Australia 30.
Metal including alloys:				
Scrap	30	--		
Unwrought	5,733	5,610	31	Japan 5,041.
Semimanufactures	3,938	4,380	325	Japan 3,223; Australia 293; New Zealand 170.
Iron and steel: Metal:				
Scrap	8,790	25,031	21,597	Australia 2,423.
Pig iron, cast iron, related materials	2,140	4,097	37	China 2,999; Japan 666; Sweden 368.
Ferroalloys:				
Ferromanganese	1,079	2,167	--	China 530; Norway 450; India 299.
Unspecified	1,125	1,303	11	China 747; Japan 138; Sweden 121.
Steel, primary forms	372,534	679,866	5,819	Republic of Korea 195,194; Japan 122,182; Taiwan 99,463.
Semimanufactures:				
Bars, rods, angles, shapes, sections	62,127	114,055	732	Japan 58,044; China 15,366; Taiwan 13,035.
Universals, plates, sheets	291,006	342,953	33,707	Japan 206,384; Taiwan 22,467; Republic of Korea 11,445.
Hoop and strip	6,074	7,005	191	Japan 6,216; Hong Kong 136; West Germany 129.
Rails and accessories	2,891	1,841	135	Japan 978; Belgium-Luxembourg 640.
Wire	8,545	9,551	118	Japan 5,834; Republic of Korea 2,832.
Tubes, pipes, fittings	41,598	37,320	1,386	Japan 26,061; Taiwan 4,116; Singapore 2,612.
Castings and forgings, rough	--	30	6	West Germany 16; Japan 6.
Lead:				
Oxides	75	85	11	Australia 43; China 20.
Metal including alloys:				
Unwrought	7,019	6,323	349	Australia 4,281; Japan 732; Taiwan 605.
Semimanufactures	217	276	10	West Germany 112; Belgium-Luxembourg 58; Netherlands 37.
Magnesium: Metal including alloys, all forms	^{r}36	45	21	Norway 24.
Manganese:				
Ore and concentrate	1,984	3,021	--	Singapore 2,676; Japan 248.
Oxides	1,331	1,409	13	Japan 1,242.
Mercury 76-pound flasks	135	101	1	Japan 74; Australia 4.
Molybdenum: Metal including alloys, all forms	^{r}92	10	(2)	Mainly from Netherlands.
Nickel: Metal including alloys:				
Unwrought	75	82	6	Hong Kong 29; Japan 28; Canada 11.
Semimanufactures	43	56	1	Australia 29; Canada 5; Japan 4.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$19	$10	$4	West Germany $5.
Silver: Metal including alloys, unwrought and partly wrought do	^{r}$74	$38	$21	West Germany $8; United Kingdom $5.
Tin: Metal including alloys:				
Unwrought	6,339	429	28	Indonesia 124; Malaysia 92; Singapore 92.
Semimanufactures	6	5	--	United Kingdom 3; Taiwan 1.
Titanium:				
Ore and concentrate	676	1,099	--	Australia 1,089.
Oxides	1,162	1,894	222	Australia 544; Japan 524; United Kingdom 207.
Tungsten: Metal including alloys, all forms	^{r}4	3	(2)	Belgium-Luxembourg 1; Netherlands 1.
Uranium and/or thorium: Metal including alloys, all forms kilograms	--	183	136	Japan 47.
Zinc:				
Oxides	638	713	51	Taiwan 474; China 40; West Germany 33.
Metal including alloys:				
Unwrought	19,476	21,704	685	Japan 8,049; Canada 6,859; Australia 3,300.
Semimanufactures	417	392	288	Japan 36; China 30.
Zirconium: Ore and concentrate	128	92	1	Australia 91.
Other:				
Ashes and residues	54,336	63,997	--	All from Japan.
Base metals including alloys, all forms	^{r}239	38	12	China 10; Singapore 5.

See footnotes at end of table.

Table 3.—Philippines: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.:				
Artificial: Corundum	3	78	(2)	Japan 77.
Dust and powder of precious and semiprecious stones value, thousands	[r]$181	--		
Grinding and polishing wheels and stones	900	808	65	Japan 116; West Germany 115; China 97.
Asbestos, crude	5,499	2,200	585	Australia 755; Canada 499; Mozambique 118.
Boron materials:				
Crude natural borates	--	67	9	Singapore 58.
Oxides and acids	963	1,941	545	Japan 736; Hong Kong 555; Taiwan 105.
Cement	11,381	10,814	329	Japan 10,153.
Clays, crude	45,027	29,170	14,492	Republic of Korea 4,200; Japan 3,659; Indonesia 1,200.
Diamond: Industrial carats	73,950	22,900	--	Belgium-Luxembourg 11,850; Australia 8,300.
Diatomite and other infusorial earth	1,173	1,259	582	Japan 618.
Feldspar, fluorspar, related materials	5,176	1,855	259	India 580; China 390; Italy 196.
Fertilizer materials: Manufactured:				
Ammonia	85,457	32,167	18,817	Indonesia 6,717; Japan 4,983.
Nitrogenous	322,863	469,990	70,975	Indonesia 115,843; Republic of Korea 81,107; U.S.S.R. 67,441.
Phosphatic	150,069	58,228	54,554	Republic of Korea 3,600.
Potassic	88,976	100,181	3,828	Canada 80,480; West Germany 7,721.
Unspecified and mixed	61,564	117,418	42	Republic of Korea 116,851.
Graphite, natural	177	206	19	China 113; West Germany 21; Norway 18.
Gypsum and plaster	75,596	63,965	230	Japan 16,650; Republic of Korea 16,148; Australia 14,039.
Magnesite	3,198	5,404	123	Japan 3,801; China 1,199.
Mica:				
Crude including splittings and waste	77	173	16	China 80; India 54.
Worked including agglomerated splittings	5	12	1	India 5; Hong Kong 4.
Phosphates, crude	5	12	--	Japan 11.
Pigments, mineral:				
Natural, crude	1,975	3,405	(2)	India 2,618; United Kingdom 698.
Iron oxides and hydroxides, processed	983	845	5	West Germany 582; Spain 121; China 50.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$21	$3	$3	
Synthetic do	--	$491	$34	Belgium-Luxembourg $378.
Salt and brine	44,679	130,586	68	Australia 78,973; Mexico 23,076; China 21,997.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	91,251	82,551	30,342	Kenya 17,550; Japan 11,706; East Germany 11,185.
Sulfate, manufactured	7,298	11,187	9	China 4,740; Taiwan 4,034; Japan 2,092.
Stone, sand and gravel	31,537	41,542	232	Malaysia 17,852; Japan 9,896; Australia 7,708.
Sulfur:				
Elemental:				
Crude including native and byproduct	497	1,564	125	Singapore 994; Taiwan 189; Australia 143.
Colloidal, precipitated, sublimed	19,007	22,615	5,411	Canada 17,000.
Dioxide	51	21	20	Netherlands 1.
Sulfuric acid	119,550	79,127	4,017	Japan 75,087.
Talc, steatite, soapstone, pyrophyllite	9,780	8,669	747	Republic of Korea 4,962; China 1,921; Hong Kong 473.
Other:				
Crude	[r]514	580	71	Australia 220; Singapore 162; Finland 125.
Slag and dross, not metal-bearing	90,707	231,760	(2)	Japan 178,886; India 52,765.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	1,939	1,133	340	Thailand 296; Japan 258; China 122.
Coal, all grades including briquets	12,946	120,439	492	Australia 112,926.
Coke and semicoke	215,193	271,664	--	Japan 270,362.

See footnotes at end of table.

Table 3.—Philippines: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum:				
Crude thousand 42-gallon barrels	^{r}61,378	54,400	--	Saudi Arabia 26,921; Kuwait 6,482; Abu Dhabi 5,102.
Refinery products:				
Liquefied petroleum gas do	1,127	1,882	(2)	Saudi Arabia 1,207; Indonesia 663.
Gasoline do	40	44	43	NA.
Mineral jelly and wax do	104	85	4	China 48; Hong Kong 21; Japan 7.
Distillate fuel oil do	10,417	8,403	767	Singapore 3,762; Kuwait 2,969.
Lubricants do	135	104	74	Netherlands 7; Singapore 6; Japan 5.

^{r}Revised. NA Not available.

[1] Table prepared by Audrey D. Wilkes.

[2] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Chromium.—Mine production of both metallurgical- and refractory-grade chromite ore decreased. Despite an increase in milled ore and a higher recovery rate by Acoje Mining Co. Inc., the overall output of metallurgical-grade chromite ore and concentrate declined because of reduced ore production by other small producers. On the other hand, the continuing decline in the output of refractory-grade chromite ore and concentrate was attributable to a restructuring of operations at the Masinloc Mine by Benguet and lower demand from the United States and Japan.

The Masinloc Mine in Zambales, owned by Consolidated Mines Inc. and operated by Benguet, remained the major source of quality refractory-grade chromite. The output of refractory-grade chromite concentrate dropped to 151,000 tons in 1982 from 400,000 tons in 1979. The estimated output for 1983 was about 100,000 tons. The main ore body at the Coto deposit was dwindling. The major mining operations were at the open pit ore bodies, G-Layer/CLL, 909, Hayden-Lenses, 587, and 787. The combined reserves of the five ore bodies were estimated at about 1.4 million tons, averaging 29.4% to 33.1% Cr_2O_3 and 5% to 8% SiO_2.[4]

The restructuring of the chromite operations, including development of two underground ore bodies 1111 and Lower Western, was carried out by Benguet and scheduled for production by 1985 at an annual rate of 200,000 to 250,000 tons of refractory-grade chromite concentrate. The combined ore reserves of the two underground ore bodies were estimated at 2.7 million tons, averaging 31.2% to 34.5% Cr_2O_3 and 5.1% to 5.3% SiO_2.

Philchrome Mining Corp., which commenced refractory-grade chromite mining operations in 1981, concluded a joint venture contract with AMAX Inc. of the United States and Kawasaki Steel Corp. of Japan in 1983 to market its product in the United States and Japan. Production of chromite sand was by hydraulicking in the Narra and Teresa areas on Palawan Island. The concentration plant has an annual capacity of 20,000 tons of concentrate. The ore reserves of the company were estimated at 2.6 million tons, averaging 44.3% Cr_2O_3.

Acoje remained the dominant producer of metallurgical-grade chromite ore and concentrate. The Acoje Mine at Santa Cruz in Zambales produced about 75% of metallurgical-grade chromite ore and concentrate from underground operations and 25% from three open pit operations. The company also produced lumpy ore from its newly developed open pit operation on Dinagat Island in Surigao del Norte.

The output of metallurgical-grade chromite concentrate and direct shipping lumpy ore was 103,761 tons and 7,000 tons, respectively, in 1982. The 1983 estimated output was slightly higher than that of 1982 because of the productivity increase. However, Acoje reportedly suffered financial difficulties from its heavy debt servicing problem. The proven ore reserves for the Acoje Mine were estimated at 4.6 million tons, averaging 19.64% Cr_2O_3, and for the Dinagat deposit, were estimated at 4.3 million tons, averaging 45% Cr_2O_3.

Ferrochrome Philippines, a joint venture of Austria's Voest-Alpine AG (80%) and the Herdis Group of Manila (20%), commenced operations in January to produce high-carbon ferrochromium at Tagoloan in Misamis Oriental on Mindanao Island. However, because of the power supply problem, the actual commercial production was delayed until April with a monthly production of 3,000 tons and reached 3,800 tons in November. The estimated output of ferrochromium was 20,000 tons in 1983 compared with the design capacity of 50,000 tons per year. Of the 130,000 tons of ore requirements, about 80% was supplied by Acoje and 20% by minor local mines. The company reportedly has purchased about 15,000 tons of chromium ore from India and New Caledonia to supplement its raw material requirements in 1984. Ferrochrome Philippines exported all of its 1983 production of high-carbon ferrochromium to Japan.[5]

Export earnings of Philippine chromite ore and concentrate dropped from $44.3 million in 1980 to $22.8 million in 1982 as a result of the reduction in export quantity and unit value owing to the weak demand from the United States and Japan.

Copper.—The financial situation of the Philippine copper industry improved slightly from last year's worst loss in its history as the world copper prices rose in 1983. However, many major producers remained cautious about increased production and new development work. Some small producers refused to resume operations of closed mines and facilities because of high production costs and a lack of operational funds.

Despite the most adverse conditions, the copper industry continued to contribute about 30% to the total value of the Philippine nonfuel mineral production, which was estimated at $1.3 billion for 1982. The export value of copper concentrate also contributed about 6% to the country's total export earnings in 1982.

According to the Chamber of Mines of the Philippines, mine production of copper metal declined only 2.6% in 1982 from that of 1981. Copper production was up 1.2% for the first 9 months in 1983 from that of the same period in 1982 with 6 out of 14 primary producers not operating. Production of copper, by company, during 1982-83 was as follows, in thousand tons of copper metal:

Company	1982	9 months	
		1982	1983
Atlas Consolidated Mining and Development Corp	134.4	99.8	93.8
Marinduque Mining and Industrial Corp	37.4	28.9	28.3
Marcopper Mining Corp	36.7	27.2	25.8
Benguet Corp	26.0	18.5	18.8
Philex Mining Corp	22.9	17.0	16.2
Lepanto Consolidated Mining Co. Inc	17.2	12.8	12.8
Basay Mining Corp. (formerly CDCP Mining Corp.)	7.5	4.8	5.4
North Davao Mining Corp.[1]	7.1	--	12.6
Hercules Minerals and Oils Inc.[2]	1.5	1.5	--
Black Mountain Inc.[3]	1.4	.7	--
Western Minolco Corp.[4]	.6	--	--
Baguio Gold Mining Co. Inc.[5]	--	--	--
Acoje Mining Co. Inc.[5]	--	--	--
Sabena Mining Corp.[6]	--	--	--
Benguet Exploration Inc	.1	.1	.1
Zambales Base Metals Inc.[6]	--	--	--
Total	292.8	211.3	213.8

[1] Commenced production in August 1982.
[2] Shut down production since July 1982.
[3] Shut down production since June 1982.
[4] Shut down production since April 1982.
[5] Shut down production since January 1982.
[6] Shut down production since 1981.

Black Mountain Inc., which shut down its operations in June 1982, was acquired by Benguet Exploration Inc. for $2.7 million in October 1983.

The Amacan copper-gold project of North Davao Mining Corp. came on-stream in August 1982. An estimated $76 million of services and equipment was reportedly supplied by three Finnish companies, Kone Oy, Outokumpu Oy, and Rauma-Repola Oy. The copper mining and milling operation was producing at a monthly rate of 1,500 tons of copper metal from the Amacan, Masara, and Mabini areas in Davao del Norte on Mindanao Island. The ore reserves of the three areas were estimated at 161 million tons, averaging 0.37% copper and 0.17 gram of gold per ton of ore.

CDCP Mining Corp., the country's seventh largest copper producer, changed its name to Basay Mining Corp. in May to avoid confusion with its parent company, CDCP. In March, the Government had taken control of CDCP through conversion of an estimated $400 million in loans into 90% holding of the company's equity.[6]

Basay Mining, which operated its mining and milling complex at Basay on Negros Island, was hit hardest by high production costs and the low copper prices. As a result, the output of copper metal dropped from 20,400 tons in 1980 to 7,500 tons in 1982. During 1983, Basay Mining suspended operations in February and was operating way below capacity. The ore reserves at the

Basay Mine were estimated at 236 million tons, averaging 0.44% copper and 0.284 gram of gold and 56.133 grams of silver per ton of ore.

Atlas, the Philippines' largest copper producer, started an expansion program called the Second Lift project of its Lutopan underground copper deposit at Toledo in Midwestern Cebu and was 90% completed by yearend. The project was to develop and mine the deeper level of the Lutopan underground ore body for production by April 1984. Atlas also operated two open pit mines—Biga Pit and Carmen Pit—and three concentrators with a total milling capacity of 110,000 tons per day in the Toledo area. The latest ore reserves in the area were estimated at 942 million tons averaging 0.45% copper. To save energy costs, Atlas reportedly completed its coal conversion project in March, which will reduce its power cost by 25%.

In April, Philex, the most profitable copper producer, approved a $33 million expansion program to increase its copper milling capacity in Baguio, Benguet, from 27,000 to 37,000 tons per day by 1987.

NDC extended its copper subsidy program, a 76-cent-per-pound guarantee to copper producers, for 3 months from February 1 to April 30, 1983.

PASAR completed its smelter at Isabel in southern Leyte in March and officially inaugurated it on June 29. The copper smelting and refining complex began production of copper cathodes in July.

Because of an unstable power supply, mechanical adjustments to the plant, and shortage of concentrate, production of refined copper was below the planned output of 60,000 tons for July to December. Despite the higher treatment and refining charges, most copper producers shipped about 30% of the copper concentrate to PASAR, except Benguet, because the copper concentrate produced by Benguet reportedly has a high mercury content, which PASAR cannot process. By yearend, the Japanese consortium, which was expected to distribute 105,000 tons per year of the smelter output, reportedly has successfully concluded a sale of 50,000 tons to Japanese copper fabricators with shipments to begin in February 1984 for 1 year.

In May, ASEAN Copper was established by state-owned NDC and its counterparts in other ASEAN (Association of Southeast Asian Nations) countries to build a $300 million copper fabrication plant adjacent to the PASAR smelter at Isabel in Leyte. The fabrication plant will have an annual capacity of 100,000 tons of copper products and was scheduled to be completed in 1987. NDC will hold 60% of the company's equity, and the remaining 40% was to be equally distributed among Indonesia, Malaysia, Singapore, and Thailand.[7]

Gold.—The Philippines was the world's eighth largest gold producer, accounting for about 2% in 1982. Gold mining contributed about 22% to the total value of the Phillippine nonfuel mineral production in 1982. In early 1983, mine output of gold improved slightly despite the four idle copper-gold mining operations of Acoje, Baguio Gold Mining Co. Inc., Black Mountain, and Western Minolco Corp.

Surigao Consolidated Mining Co., which started its open pit mine at Barrio Siana in Surigao del Norte in July 1982 with a milling capacity of 1,000 tons per day, joined the list of leading primary producers. North Davao Mining, which started its copper-gold project at Amacan in Davao del Norte in August 1982, joined the list of leading byproduct producers. The opening of these two mines and continued improvements in mill recovery rates of Benguet and Philex contributed to the increase in overall gold production for the first 9 months of 1983. As a result of increased gold production, Benguet reportedly has reduced its cost of production from $365 per ounce in the third quarter of 1982 to $351 per ounce in the first quarter of 1983.[8]

According to the Chamber of Mines of the Philippines, gold production of the top 10 companies during 1982-83 was as follows, in thousand troy ounces of gold:

Company	1982	9 months	
		1982	1983
Benguet Corp. (primary and byproduct)	235.8	164.2	162.9
Atlas Consolidated Mining and Development Corp. (primary and byproduct)	203.5	144.1	137.5
Philex Mining Corp. (byproduct)	128.6	93.0	102.2
Lepanto Consolidated Mining Co. Inc. (byproduct)	74.8	58.6	48.5
Apex Mining Co. Inc. (primary)	47.2	35.4	34.0
Marcopper Mining Corp. (byproduct)	35.8	25.4	24.4
North Davao Mining Corp. (primary and byproduct)	26.3	12.3	26.6
Benguet Exploration Inc. (primary)	14.4	10.7	9.7
Itogon-Suyoc Mines Inc. (primary)	13.8	10.2	10.3
Surigao Consolidated Mining Co. (primary)	--	--	22.0
Other (primary and byproduct)	30.9	18.8	21.0
Total	811.1	572.7	599.1

Other gold producers in 1983 were MMIC, (byproduct), Vulcan Industrial and Mining Corp. (primary), Manila Mining Corp. (primary), and Basay Mining (byproduct).

Of the total gold produced in 1982, 37% was by primary producers and 63% was by copper producers as byproduct. For the first 9 months of 1983, primary producers accounted for 42% of the total gold production and copper producers accounted for 58%.

In April, an agreement was signed between Tirad Minerals Inc. and Gold Fields Asia Ltd. of Australia to explore and develop a rich gold and copper deposit in Mankayan, Benguet. Based on the initial drilling by Gold Fields, the deposit has estimated ore reserves of 100 million tons, grading 0.4% copper and 0.4 gram of gold per ton of ore. Gold Fields was committed to spend $1.5 million for the first year in the initial evaluation phase and an additional $4.5 million in the second phase of exploration in the next 30 months.[9]

Basay Mining and Eaton Development Inc. reportedly were exploring a gold deposit at Hinobann in Negros Occidental. The exploration project was funded by Eaton Development. A feasibility study was to follow in 1984.

The Batong Buhay Gold Mines Inc. postponed operations again in mid-1983 because of the company's failure to resolve the right-of-way problem for the transmission line of the National Power Corp. to the minesite.

Iron and Steel.—Mine production of iron ore remained small. The total output of lump ore and magnetite sand was 6,826 tons in 1982. San Pio Quinto Mining Corp. and Construction Aggregate Producers Co. remained the major producers. The output of iron ore for the first quarter of 1983 was only 1,372 tons compared with 2,220 tons for the same period of 1982.

In August, the Philippine state-owned National Steel Corp. (NSC) and a Japanese consortium led by Marubeni Corp. formally signed a $383 million contract to build the first stage ironmaking facilities of NSC's 1.4-million-ton-per-year integrated steel complex in Iligan City of northern Mindanao. The turnkey contract calls for construction of six direct-reduction furnaces, a raw material processing plant, and a limestone mill by the fall of 1987. However, before the final negotiations on the financing of the project were reached, the Government decided to defer the construction of the ironmaking facilities in December because of the financial crisis in the Philippine economy.[10]

The Philippine ferroalloy industry has grown substantially over the past years in the Iligan City and Cagayan areas of northern Mindanao owing to the availability of cheap hydroelectric power in the areas (about 2 cents per kilowatt hour). In addition to the newly established Ferrochrome Philippines, three small ferroalloy producers were operating in the area in 1983. Ferro-Chemicals Inc. at Manticao in Misamis Oriental produced high-carbon ferrochromium with an annual capacity of 8,000 tons. Electro Alloys Corp. and Maria Cristina Chemical Industries (MCCI) in Iligan City, produced ferrosilicon with an annual capacity of 10,000 tons and 17,000 tons, respectively.

In September, MCCI and Nippon Kokan K.K. and Marubeni of Japan jointly established Mindanao Ferroalloys Co. to build a ferrosilicon plant in Iligan City. The $12 million ferrosilicon plant will have an annual capacity of 15,000 tons and was scheduled for production in October 1984. The equity capital of $5 million was owned 60% by MCCI, 17.5% by Nippon Kokan, 17.5% by Marubeni, and 5% by International Finance Corp. (IFC), a subsidiary of the World Bank. The remaining $7 million was financed by loans from IFC, the Government of the Philippines, and local banks.[11]

Nickel.—Surigao nickel refinery on Nonoc Island was shut down from December 1982 to April 1983 for converting its energy source from oil to coal. The $130 million conversion project was completed in April. As a result of the coal conversion, the cost of refined nickel production reportedly would be reduced by 40% to about $1.80 per pound. MMIC reopened and started nickel production in May. The company planned to produce 2,000 tons of nickel per month for the second half of 1983; however, the output of nickel was about 1,600 tons per month during June and September. By yearend, MMIC was forced to shut down its nickel refinery again because of a shortage in operational funds.

MMIC produced 13,495 tons of nickel and 571 tons of cobalt in 1982. Because of the low nickel price and heavy burden of financing charges, the company incurred a loss of $227 million in 1982 and about $150 million in 1983. MMIC's total outstanding debts reportedly were over $1 billion with an accumulated loss of about $570 million during the past 10 years of operations. In

October, MMIC was granted an exemption from all taxes, fees, and other official charges by the Government until the end of 1988.[12]

In June 1982, Hinatuan Mining Corp., a new nickel ore producer, began nickel ore mining operations on Hinatuan Island in Surigao del Norte. The company produced 43,292 tons of nickel ore from June to December 1982 and 50,141 tons of ore for the first 9 months of 1983. The laterite ore reserves of the Hinatuan's mining area were estimated at 1.5 million tons, averaging 2.25% nickel and 0.09% cobalt.

Rio Tuba Nickel Mining Corp. produced 325,000 tons of ore at Bataraza on Palawan Island in 1982. For the first 9 months of 1983, the output of ore was 298,850 tons compared with 294,900 tons for the same period in 1982. Rio Tuba reportedly asked Mineral Processing Research Institute of Sweden and Pacific Metal Co. Ltd. of Japan to conduct the feasibility studies on ore segregation and processing. The company was planning to smelt its nickel ore in the Philippines.[13]

NONMETALS

Cement.—As part of the nationwide coal conversion program, the cement industry continued its effort to cut the energy costs of cement production. Two cement plants started production with the coal-fired kilns in northern Mindanao. These two plants were Floro Cement Corp. in Lugait, Misamis Oriental, and Iligan Cement Corp. in Iligan City, Lanao del Norte. After completion of coal conversion, Iligan Cement reportedly has reduced its fuel costs by 25%.

By mid-1983, two additional coal conversion projects were completed by Krupp Polysius AG of the Federal Republic of Germany for Northern Cement Corp. and CDCP Midland Cement Corp. in Pangasinan. According to industry sources, a total of eight plants, including Island Cement operation of MMIC in Antipolo, Rizal, have more or less completed the coal conversion. Republic Cement Corp. reportedly was expanding its grinding facilities by adding a coal grinding plant in Norzagaray, Bulacan, during the year. The equipment was provided by Polysius Ltd. of the United Kingdom, a subsidiary of Krupp Polysius AG.

Fertilizer Materials.—The Philippines Phosphate Fertilizer Corp. (Philphos), a joint venture of NDC and Nauru Phosphate Corp., started construction of a pyrite recovery plant at Basay in Negros Oriental. The pyrite, to be retrieved from mine tailings of Basay Mining's copper operations on Negros Island, will be used by Philphos for production of fertilizer when the phosphate-fertilizer complex at Isabel on Leyte Island is completed at the end of 1984.

Construction work on the phosphoric acid plant of the Polyphosphates Inc., a joint venture of Chemical Industries Corp. and Albright & Wilson Ltd. of the United Kingdom, was moving according to schedule. A phosphorus burning unit was purchased and shipped from Industrias Resistol S.A. of Mexico to the construction site of the 50,000-ton-per-year phosphoric acid plant at Pasig near Manila. The phosphoric acid plant was scheduled for completion by yearend 1983.[14]

MINERAL FUELS

Coal.—Coal production continued to increase as demand for coal rose. In 1983, domestic demand for coal was expected to reach 1 million tons owing to completion of various coal conversion programs in the utility, cement, and mining industries. In 1982, domestic demand was only 354,000 tons because of delays in completion of several coal conversion projects in cement, mining, and metal refining sectors.

Coal development activities continued in Cebu, Zamboanga del Sur, Semirara Island, and Batan Island. In 1982, 75% of coal output was from the Cebu and Zamboanga del Sur areas. However, the coal output from Semirara Island and Batan Island was expected to grow as the two newly developed open pit mines reach full capacity in 1984 or 1985.

Semirara Coal Corp., which operated an open pit mine in the Unong area with an annual capacity of 360,000 tons, was expected to produce 1.3 million tons per year when development is completed in 1984. Voest-Alpine of Austria was to supply four bucket-wheel excavators, a stacker, a reclaimer, a coal conveyor system, and to construct a pier, a 15-megawatt powerplant, dewatering wells, and maintenance and operation facilities.

Coalfields Mining and Industrial Corp. began production at 500 tons per day in Eastern Batan in 1982. The open pit mine reportedly can be expanded to a 1,000-ton-per-day capacity.

Another open pit coal mine that began production in mid-1983 was owned and operated by MMIC at Bagacay in Samar. The initial production was about 1,000 tons per month of coal. A coal washing plant was under construction near the mine. The coal produced from the Bagacay area was shipped to the company's Surigao nickel refinery for use in its coal boilers.

Petroleum.—Philippine crude oil production from the five existing offshore oilfields increased about 60% and reached 5 million barrels in 1983. During the year, two new offshore oilfields—Panadan and Libro—came on-stream. The output of crude oil increased from 13,800 barrels per day in the first quarter to 16,700 barrels per day in the second quarter, then began to fall in the third quarter to 13,000 barrels per day. According to the Philippines Bureau of Energy Development, unless new oil finds are made, crude oil output will continue to decline because of the dwindling output from Nido Oilfield.

By yearend, a new oil well was discovered by the Philippines-Cities Service Inc., a wholly owned subsidiary of Occidental Petroleum Corp. of the United States, offshore northwest of Palawan. The new oil well, Galoc 2, is about 2 kilometers north of Galoc 1 discovered in 1981. Galoc 2, the first deepwater oil well, reportedly is capable of producing 1,700 to 2,000 barrels of light crude per day.[15]

Because of limited success in locating large oilfields, the reduction in the world's oil prices, and tight company budgets, oil exploration activity in the Philippines continued to decline. During the year, only Oriental Petroleum Corp. of the Philippines and Chinese Petroleum Corp. of Taiwan were conducting exploratory drilling in the Central Luzon area.

In October, Mobil Corp. sold its 40% interest in the Bataan Refining Corp. to Philippines National Oil Co., which already owned 60% of the refinery. Mobil also sold its retail outlets and distribution system for industrial customers to Caltex Petroleum Corp. of the United States. The pullout of Mobil from the Philippines was the third multinational oil company pullout in the past 10 years, following Exxon Corp. in 1973 and Getty Oil Co. in 1980.[16]

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[1] Economist, Division of Foreign Data.

[2] Bulletin Today (Manila). Jan. 24, 1984, p. 9.

[3] Where necessary, values have been converted from the Philippine peso (₱) to U.S. dollars at the rate of ₱8.6=US$1.00 in 1982, and ₱11=US$1.00 in 1983.

[4] Besa, R. A., and S. D. Dela Cruz. Masinloc Chromite Operation Today and the Future, Masinloc Chromite Operation. Benguet Corp., May 1982.

Boyce, J. The Chromite Project Definition Mission to the Philippines. Feb. 1983.

[5] The Tex Report Ltd. (Tokyo). The Tex Report. V. 15, No. 3600, Nov. 29, 1983.

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[6] The Asian Wall Street Journal. V. 7, No. 122, Feb. 24, 1983, p. 1.

[7] Philippines Daily Express (Manila). May 7, 1983, p. 8.

[8] Bulletin Today (Manila). May 7, 1983, p. 15.

[9] Philippines Daily Express (Manila). Apr. 26, 1983, p. 10.

[10] Metal Bulletin (London). No. 6811, Aug. 9, 1983, p. 23.

Philippines Daily Express (Manila). Dec. 15, 1983, p. 10.

[11] The Tex Report (Tokyo). V. 15, No. 3561, Sept. 30, 1983, p. 13.

[12] Metal Bulletin (London). No. 6833, Oct. 28, 1983, p. 13.

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The Asian Wall Street Journal. V. 8, No. 102, Jan. 25, 1984, p. 13.

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[13] The Tex Report (Tokyo). V. 15, No. 3590, Nov. 14, 1983, p. 16.

[14] Chamber of Mines of the Philippines. Newsletter. V. 8, No. 4, Apr. 1983, p. 1.

[15] Bulletin Today (Manila). Dec. 17, 1983, p. 1.

[16] Petroleum Economist. Oct. 1983, p. 401.

The Mineral Industry of Poland

By Tatiana Karpinsky[1]

In 1983, Poland continued to be a large producer of coal, lignite, sulfur, and copper. Other minerals produced in Poland included lead, zinc, aluminum, nickel, silver, cadmium, natural gas, and crude oil. Iron ore was extracted on a small scale. Shortage of coking coal remained a problem; the use of coking coal did not increase, and demand exceeded production.

After 4 years of depression, starting in 1979, the Polish economy showed slow overall growth in 1983.[2] Gross industry production increased by 6.7% compared with that of 1982; production of the manufacturing industry increased by 7.1%; and production of the mining industry increased by 2.3%. However, total industry production was still 10.3% below that of 1979.

At the end of 1983 the national debt to Western creditors totaled $26.4 billion. Additionally, liabilities to the Council for Mutual Economic Assistance (CMEA) countries, in particular the Soviet Union, amounted to 3.8 billion rubles.

Government Policies and Programs.—In April 1983, the Sejm (Parliament) adopted the 1983-85 Socioeconomic Plan. The main goal stipulated by the plan was to restore the economy and ensure development. Industrial production was planned to increase by 4.5% to 5.5% over that of 1983. The supply of fertilizers, lignite, oil, soda ash, and sulfur was planned to increase over 5%. The production of electric energy, cold-rolled metal sheets, aluminum, and cement was to increase moderately, up to 5%. The production of bituminous coal, natural gas, coke, rolled products, piping, zinc sheets, rods, copper, zinc, lead, and tin was to be stabilized, or to continue at the 1983 level.

PRODUCTION

Reportedly, the basic tasks of the 1983 economic plan for the mineral industry were fulfilled, and were exceeded in lignite, copper, sulfur, and electric energy production. Production of petroleum products, crude steel, steel rolled products, zinc, and lead slightly increased, but production of many minerals was less than that of 1982. Coke from bituminous coal, crude oil, and natural gas production decreased slightly. The amount of bituminous coal and lignite extracted and the production of electric energy fully met domestic and export demands. Polish aluminum production fell by 35% in 1982 and remained at that low level. The fuel and power industries contributed 14.7% to Poland's total industrial output; ferrous industry, 5.6%; nonferrous industry, 3.2%; and nonmetallic mineral industry, 3.6%.[3]

Total population of the country was 36.6 million. Employment in industry was about 5 million, of which 4.6 million were in large socialized enterprises, including 11.7% in mining.

Table 1.—Poland: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum metal, primary	96,600	95,100	66,000	42,700	[3]44,400
Cadmium metal, primary	773	698	580	500	570
Copper:					
Mine output, metal content, recoverable	325,000	346,125	315,250	376,000	387,000
Metal:					
Smelter including secondary	341,000	363,500	330,770	[e]351,000	362,000
Refined including secondary	335,800	357,300	327,210	348,000	[3]360,000
Iron and steel:					
Iron ore and concentrate, gross weight thousand tons	249	104	105	49	[3]10
Pig iron do.	10,966	11,600	9,350	8,523	[3]9,716
Ferroalloys:					
Blast furnace do.	138	126	126	126	126
Electric furnace do.	176	170	170	170	170
Steel:					
Crude do.	19,218	19,485	15,719	14,795	[3]16,236
Semimanufactures:					
Rolled excluding pipe do.	13,577	13,551	11,064	10,477	[3]11,731
Pipe do.	1,161	1,132	1,043	940	[3]995
Lead:					
Mine output, metal content, recoverable	61,900	60,040	50,434	57,495	59,200
Metal, smelter	84,200	82,000	69,000	78,800	[3]81,000
Nickel:[e]					
Mine output, metal content, recoverable	2,100	2,100	2,100	2,100	2,100
Metal, smelter	2,100	2,000	2,100	2,100	2,100
Silver, mine output, metal content, recoverable thousand troy ounces	22,600	24,665	20,576	21,123	[3]21,798
Zinc:					
Mine output, metal content	182,700	187,800	146,484	[e]145,000	149,000
Metal, refined, including secondary	209,000	215,300	167,100	165,400	[3]170,300
NONMETALS					
Barite	96,000	96,300	85,300	90,600	100,000
Cement thousand tons	19,176	18,443	14,226	16,100	[3]16,200
Clays:					
Crude:					
Bentonite[e] do.	50	50	50	70	70
Fire clay do.	1,251	1,200	1,200	[e]1,200	1,200
Kaolin do.	49	51	43	[e]45	45
Products do.	687	600	600	[e]600	600
Feldspar[e] do.	40	40	82	80	80
Gypsum and anhydrite, crude[e] [4] do.	1,360	1,300	[3]1,311	1,400	1,300
Lime, hydrated, and quicklime do.	[r]4,782	[r]4,830	4,179	4,061	[3]4,209
Magnesite, crude	20,000	19,600	11,300	16,100	16,000
Nitrogen: N content of ammonia thousand tons	1,525	1,543	1,389	1,423	1,400
Salt:					
Rock do.	1,458	1,465	1,313	1,338	[3]1,131
Other do.	2,971	3,069	2,958	2,518	2,500
Sodium and potassium compounds, n.e.s.:					
Sodium carbonate (soda ash) do.	684	762	701	[e]700	700
Caustic soda (96% NaOH) do.	454	433	417	378	[3]408
Stone:					
Dolomite do.	3,296	3,437	3,070	[e]3,100	3,100
Limestone do.	NA	60,877	50,000	NA	NA
Other do.	17,610	16,000	16,000	NA	NA
Sulfur:					
Native:					
Frasch[e] do.	4,310	4,667	4,295	4,428	4,460
Other than Frasch[e] do.	520	518	478	492	500
Total do.	4,830	5,185	4,773	4,920	[3]4,960
Byproduct:[e]					
From metallurgy do.	310	300	300	300	300
From petroleum do.	35	30	30	30	30
Total do.	345	330	330	330	330
From gypsum[e] do.	20	20	20	20	20
Total sulfur do.	5,195	5,535	5,123	5,270	5,310
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Bituminous do.	201,004	193,121	163,022	189,300	[3]191,100
Lignite and brown do.	38,083	36,866	35,600	37,600	[3]42,500
Total do.	239,087	229,987	198,622	226,900	[3]233,600

See footnotes at end of table.

Table 1.—Poland: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Coke:					
Coke oven thousand tons	19,324	19,244	17,346	17,300	[3]17,000
Gashouse do.	950	940	573	600	600
Total do.	20,274	20,184	17,919	17,900	17,600
Fuel briquets, all grades do.	1,800	1,700	1,511	1,575	1,500
Gas:					
Manufactured:					
Town gas million cubic feet	14,233	14,000	11,763	11,500	11,500
Coke oven gas do.	261,015	250,000	229,546	[e]200,000	200,000
Natural, marketed do.	259,072	223,501	205,248	[3]195,370	[3]193,230
Natural gas liquids:					
Natural gasoline[e] thousand 42-gallon barrels	85	80	80	80	80
Propane and butane[e] do.	58	53	53	53	53
Peat: Fuel and agricultural	200,000	202,700	201,645	[e]200,000	200,000
Petroleum:					
Crude:					
As reported thousand tons	331	329	315	241	210
Converted thousand 42-gallon barrels	2,456	2,441	2,337	1,789	1,558
Refinery products[5] do.	110,465	105,978	101,078	100,910	101,200

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through July 15, 1984.

[2] In addition to the commodities listed, antimony, cobalt, germanium, gold, a variety of crude nonmetallic construction materials, and carbon black are also produced, but available information is inadequate to make reliable estimates of output levels. Poland may also produce alumina in small quantities, but details of such an operation, if it exists, are not available.

[3] Reported figure.

[4] Includes building gypsum, as well as an estimate for gypsum used in production of cement.

[5] Includes virtually all major products, but not some minor products, or refinery fuel or losses.

TRADE

Exports were valued at 1,057 billion zloty (Z)[4] and imports at Z961 billion. More than one-half of Poland's foreign trade was transacted with the centrally planned economy countries, primarily the U.S.S.R. Exports by the fuel and electric power industries contributed about 17% of Poland's total export value; ferrous and nonferrous industries, about 10%; and chemical industry, 9%. Imports by the fuel and electric power industry accounted for about 26% of total imports; chemical industry, 14%; and ferrous and nonferrous industries, 10%.

Coal exports were traditionally Poland's principal hard currency earner. Exports of coal increased substantially in 1983 but they have not returned to the precrisis, 1979 level.

On the import side, Poland maintained a steady or slightly increased level of crude oil, petroleum products, iron ore and concentrates, aluminum, manganese, chromium, magnesite, and other commodities mainly imported from the U.S.S.R.

According to a bilateral agreement, Poland will purchase from the U.S.S.R. in 1984 about 15 million tons of crude oil and petroleum products, 6 billion cubic meters of natural gas, 7.7 million tons of iron ore, 1.35 million tons of pig iron, 53,000 tons of aluminum, and 120,000 tons of ammonia. Poland will supply the U.S.S.R. with coal, sulfur, copper, and metallurgical products.

The Polish balance-of-payments situation in 1983 was precarious. Western government and private creditors agreed to reschedule Polish obligations due in 1981. In 1982, however, Western governments balked in response to the imposition of martial law. These governments insisted that Poland meet its obligations as they became due. Poland failed to do so. Western bankers did agree to reschedule Poland's 1982 obligations due them and, additionally, agreed to extend short-term, renewable trade credits to Poland in an amount equal to one-half the interest Poland paid to the bankers. In any case, Poland maintained that, absent a comprehensive rescheduling of debt coupled with the extension of new credits, it will remain deeply in debt without any chance of meeting its financial obligations.

Table 2.—Poland: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	--	2,129	--	Peru 2,114.
Ash and residue containing aluminum	4,413	3,296	--	All to West Germany.
Metal including alloys:				
Scrap	4,034	3,469	--	Austria 2,532; West Germany 779.
Unwrought	1,696	[2]2,317	--	Czechoslovakia 1,935; Italy 217.
Semimanufactures	54	91	(3)	Italy 60; Sweden 11.
Cadmium: Metal including alloys, all forms	--	43	--	All to West Germany.
Chromium: Oxides and hydroxides	243	417	86	Sweden 120; United Kingdom 83.
Copper:				
Ore and concentrate	4,008	5,937	--	All to Finland.
Metal including alloys:				
Scrap	617	1,587	--	Austria 1,031; West Germany 475.
Unwrought[2]	142,514	176,447	2,201	West Germany 93,776; United Kingdom 36,981.
Semimanufactures[2]	45,327	47,071	143	Czechoslovakia 17,116; U.S.S.R. 10,129.
Iron and steel: Metal:				
Scrap[2]	79,787	257,912	--	Austria 95,930; Yugoslavia 84,389.
Pig iron, cast iron, related materials	20	61	--	All to Norway.
Ferroalloys:				
Ferrochromium	--	22	--	All to Sweden.
Ferrosilicon	--	4,653	--	All to Norway.
Steel, primary forms thousand tons	116	108	--	Yugoslavia 47; Austria 27.
Semimanufactures do.	1,691	1,644	30	U.S.S.R. 320; West Germany 250; Yugoslavia 164.
Lead: Metal including alloys, unwrought	--	374	--	All to Belgium-Luxembourg.
Nickel: Metal including alloys, all forms	30	14	--	France 6; Yugoslavia 2.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$3	$176	--	All to West Germany.
Silver:				
Ore and concentrate do.	$39	$128	--	Do.
Metal including alloys, unwrought and partly wrought[2] thousand troy ounces	12,764	11,896	804	United Kingdom 7,202; West Germany 2,122.
Tin: Metal including alloys:				
Scrap	150	233	--	All to United Kingdom.
Unwrought	1	900	--	All to Indonesia.
Titanium: Oxides	36	47	--	Singapore 19; Japan 18.
Tungsten: Metal including alloys, all forms	19	NA		
Zinc:				
Ash and residue containing zinc	--	540	--	All to West Germany.
Metal including alloys:[2]				
Unwrought	22,161	22,519	476	United Kingdom 10,839; Hungary 5,856.
Semimanufactures	4,870	4,514	23	U.S.S.R. 1,930; Czechoslovakia 1,468.
Other:				
Oxides and hydroxides	(3)	4,642	--	All to Austria.
Ashes and residues	4,382	766	--	Sweden 495; Austria 150.
Base metals including alloys, all forms	4	1,372	--	Czechoslovakia 1,371.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1,610	35	--	Thailand 18; Yugoslavia 17.
Artificial:				
Corundum	--	687	--	West Germany 422.
Silicon carbide	1,768	2,196	--	France 943; Italy 650.
Grinding and polishing wheels and stones[4]	168	175	(4)	Yugoslavia 90; Pakistan 37.
Cement[2]	510,576	557,094	--	West Germany 218,542; Sweden 114,092.
Clays, crude:				
Andalusite, kyanite, sillimanite	6,117	NA		
Chamotte earth[2]	7,289	7,070	--	Yugoslavia 4,623; Hungary 1,795.
Fire clay	[2]19,752	19,988	--	Hungary 17,074.
Fertilizer materials: Manufactured:				
Nitrogenous[2]	27,875	32,219	--	West Germany 14,667; Pakistan 8,000.
Phosphatic	--	7,625	--	Pakistan 7,600.
Gypsum and plaster	17	134	--	Hungary 94; Finland 20.
Lime	[2]13,467	110	--	Denmark 66; West Germany 44.
Nitrates, crude	36	18	--	All to Portugal.
Phosphates, crude	--	1,000	--	All to Netherlands.
Pigments, mineral: Iron oxides and hydroxides, processed	20	40	--	All to Italy.
Salt and brine[2]	240,966	337,396	--	Finland 112,746; Sweden 92,886; Hungary 81,794.
Sodium compounds, n.e.s.: Carbonate, manufactured[2]	125,084	127,700	2,000	U.S.S.R. 37,976; China 35,268; Czechoslovakia 23,586.

See footnotes at end of table.

Table 2.—Poland: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	12,172	13,725	--	West Germany 6,129; Belgium-Luxembourg 4,447.
Worked	13,623	14,286	--	West Germany 10,389; Sweden 1,222.
Dolomite, chiefly refractory-grade[2]	--	8,913	--	West Germany 5,941.
Gravel and crushed rock[2]	302,547	251,967	--	All to West Germany.
Limestone other than dimension	636	8,321	--	West Germany 5,941; Sweden 2,370.
Sand other than metal-bearing	168,943	125,813	--	West Germany 125,726.
Sulfur:				
Elemental:				
Crude including native and byproduct[2] thousand tons	3,817	3,973	--	U.S.S.R. 818; Czechoslovakia 487; Morocco 461.
Colloidal, precipitated, sublimed	4,719	322	--	Yugoslavia 207; Singapore 75.
Sulfuric acid[2]	115,088	93,462	--	U.S.S.R. 89,269.
Other:				
Crude	4,378	3,271	--	West Germany 2,159.
Slag and dross, not metal-bearing	13,801	1,084	--	West Germany 745; Austria 213.
MINERAL FUELS AND RELATED MATERIALS				
Coal:[2]				
Anthracite and bituminous thousand tons	15,159	28,462	--	U.S.S.R. 8,869; Finland 2,130; France 1,953.
Lignite including briquets do.	1,383	941	--	East Germany 938.
Coke and semicoke[2] do.	1,515	1,720	--	U.S.S.R. 718; Romania 203; Austria 186.
Peat including briquets and litter	[2]8,695	5,880	--	West Germany 2,269; Austria 1,687.
Petroleum refinery products[2] thousand 42-gallon barrels	6,115	4,684	3	West Germany 1,815; Belgium-Luxembourg 422; Switzerland 422.

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[p] Preliminary. NA Not available.

[1] Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Poland, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2] Official Trade Statistics of Poland.

[3] Less than 1/2 unit.

[4] Totals exclude unreported quantities valued at $108,000 in 1981 and $186,000 in 1982, of which $69,000 was imported in 1982 by the United States.

Table 3.—Poland: Apparent imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate[2]	39,436	41,015	--	Hungary 22,269; Australia 18,746.
Oxides and hydroxides[2]	240,400	206,716	85	Hungary 100,023; United Kingdom 42,006.
Metal including alloys:				
Unwrought	11,898	[2]83,826	--	U.S.S.R. 34,443; Romania 31,451.
Semimanufactures[2]	14,141	20,188	(3)	U.S.S.R. 4,728; West Germany 3,942.
Bismuth: Metal including alloys, all forms	--	8	--	All from Japan.
Chromium: Ore and concentrate[2]	181,902	203,835	--	U.S.S.R. 157,977; Albania 31,021.
Cobalt: Metal including alloys, all forms	24	10	(3)	France 5; West Germany 5.
Copper: Metal including alloys:				
Unwrought	3,609	[2]1,295	--	U.S.S.R. 1,294.
Semimanufactures[2]	780	816	16	West Germany 363; U.S.S.R. 152.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite[2] thousand tons	15,870	13,493	--	U.S.S.R. 11,515; Brazil 1,652.
Metal:				
Pig iron, cast iron, related materials do.	1,449	1,273	--	Mainly from U.S.S.R.
Ferroalloys:				
Ferrochromium	1,450	NA		
Ferromanganese	25,000	35,000	--	NA.

See footnotes at end of table.

Table 3.—Poland: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Ferroalloys —Continued				
Ferromolybdenum	2	5	–	All from Sweden.
Ferrosilicon	11,881	NA		
Silicon metal	3,351	2,911	--	All from Norway.
Unspecified	27,667	34,084	--	Yugoslavia 5,342; undetermined 22,329.
Steel, primary forms thousand tons	15	185	--	Yugoslavia 19; undetermined 165.
Semimanufactures do	1,399	1,190	(3)	U.S.S.R. 719; Czechoslovakia 249.
Lead:				
Oxides	463	726	--	France 533; West Germany 193.
Metal including alloys:				
Unwrought	3,060	[2]6,358	--	United Kingdom 4,311; West Germany 1,200.
Semimanufactures	91	1	--	All from West Germany.
Magnesium: Metal including alloys, unwrought[2]	1,079	2,027	--	Belgium-Luxembourg 835; United Kingdom 745.
Manganese:				
Ore and concentrate, metallurgical-grade[2]	583,207	689,370	--	U.S.S.R. 525,637; Brazil 86,061.
Oxides	253	48	--	France 46.
Metal including alloys, all forms	--	281	--	All from France.
Mercury 76-pound flasks	--	145	--	All from United Kingdom.
Molybdenum: Metal including alloys, all forms	5	(3)	--	All from Switzerland.
Nickel: Metal including alloys, all forms	206	68	(3)	West Germany 27; Sweden 15.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$476	$3,096	$42	United Kingdom $2,785.
Silver: Metal including alloys, unwrought and partly wrought do	$744	$729	--	West Germany $412; France $223.
Tin: Metal including alloys, all forms	2,226	4,602	--	United Kingdom 3,595.
Titanium:				
Ore and concentrate	500	[2]57,426	--	U.S.S.R. 25,909; Norway 23,968.
Oxides	575	844	--	United Kingdom 658.
Metal including alloys, all forms	--	1	--	All from France.
Tungsten:				
Ore and concentrate	806	2,461	--	United Kingdom 1,323; China 1,109.
Metal including alloys, all forms	62	1	(3)	United Kingdom 1.
Zinc:				
Oxides	--	132	--	United Kingdom 121.
Metal including alloys, unwrought[2]	4,116	5,419	--	U.S.S.R. 5,417.
Zirconium: Ore and concentrate	6	900	--	Netherlands 700.
Other:				
Ores and concentrates	48,073	24	--	All from Netherlands.
Oxides and hydroxides	2,279	2,967	--	Austria 2,683; West Germany 260.
Nonferrous alloys[2]	1,764	3,095	--	All from U.S.S.R.
Base metals including alloys, all forms	228	39	--	West Germany 20; Austria 9.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	(3)	388	47	Italy 334.
Artificial: Corundum	1,022	3,781	--	Yugoslavia 2,064; Japan 680; Hungary 622.
Grinding and polishing wheels and stones[4]	884	1,048	(4)	Austria 410; Yugoslavia 288.
Asbestos, crude[2]	79,837	72,705	--	U.S.S.R. 66,863; Italy 1,700.
Boron materials: Oxides and acids	906	55	--	All from West Germany.
Cement[2]	88,509	26,220	--	U.S.S.R. 26,214.
Clays, crude:				
Bentonite	5,021	4,605	36	Hungary 4,569.
Chamotte earth[2]	21,677	17,905	--	France 12,379; West Germany 5,319.
Fire clay	[2]6,199	5,140	--	All from West Germany.
Kaolin[2]	139,379	137,028	--	Czechoslovakia 76,194; U.S.S.R. 39,942.
Diamond:				
Gem, not set or strung value, thousands	$5	$7	--	All from Belgium-Luxembourg.
Industrial do	$582	$1,982	--	Belgium-Luxembourg $1,466; Switzerland $422.
Diatomite and other infusorial earth	2,135	833	752	Denmark 60.
Feldspar, fluorspar, related materials[2]	31,246	35,756	--	Mexico 25,438; East Germany 9,884.
Fertilizer materials: Manufactured:[2]				
Ammonia thousand tons	115	118	--	All from U.S.S.R.
Nitrogenous do	156	150	--	Romania 96; Hungary 33.
Potassic do	2,865	2,377	--	U.S.S.R. 1,781; East Germany 554.
Graphite, natural[2]	7,972	6,775	8	Austria 5,174.
Gypsum and plaster	11,594	4,873	--	West Germany 4,848.

See footnotes at end of table.

Table 3.—Poland: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Magnesium compounds:				
Magnesite[2]	223,004	223,455	--	North Korea 79,963; Brazil 68,387; Czechoslovakia 64,950.
Oxides and hydroxides	185	451	--	France 400.
Other	4,578	13	--	All from Austria.
Mica:				
Crude including splittings and waste[2]	1,442	1,066	--	India 959; France 100.
Worked including agglomerated splittings	26	14	--	Austria 7; United Kingdom 7.
Phosphates, crude[2] thousand tons	2,938	3,280	432	Morocco 1,300; U.S.S.R. 644; Jordan 372.
Phosphorus, elemental	10,360	11,659	--	All from U.S.S.R.
Pigments, mineral: Iron oxides and hydroxides, processed	830	483	1	West Germany 356.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	[2]2,118	181	--	All from Hungary.
Worked	--	110	--	All from Italy.
Dolomite, chiefly refractory-grade[2]	--	15,090	--	All from Hungary.
Gravel and crushed rock[2]	10,151	7,928	--	Norway 6,253.
Quartz and quartzite	2,854	1,652	130	West Germany 1,350.
Sand other than metal-bearing	9	6	--	Sweden 4.
Talc, steatite, soapstone, pyrophyllite[2]	12,818	15,226	--	Czechoslovakia 6,670; North Korea 4,818.
Other, crude	15,474	16,085	NA	Hungary 15,014.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	165	--	United Kingdom 130.
Carbon: Carbon black[2]	21,469	15,601	--	Romania 8,001; U.S.S.R. 4,617.
Coal:[2]				
Anthracite thousand tons	31	30	--	All from U.S.S.R.
Bituminous do	1,072	972	--	U.S.S.R. 671; Czechoslovakia 301.
Gas, natural: Gaseous[2] million cubic feet	185,791	198,503	--	All from U.S.S.R.
Peat including briquets and litter	23	41	--	All from Sweden.
Petroleum:[2]				
Crude thousand 42-gallon barrels	99,299	97,196	--	U.S.S.R. 95,154.
Refinery products do	29,585	23,608	NA	U.S.S.R. 15,963; Romania 739; Hungary 377.

[p] Preliminary. NA Not available.

[1] Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Poland, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2] Official Trade Statistics of Poland.

[3] Less than 1/2 unit.

[4] Totals exclude quantities valued at $186,000 in 1981 and $117,000 in 1982, of which $2,000 was exported in 1982 by the United States.

COMMODITY REVIEW

METALS

Copper.—Copper production increased in 1983. Copper ore was extracted from five mines: Lubin, Polkowice, Rudna, Konrad, and Sieroszowice (under development) in the Legnica-Glogow region. Ore was extracted from depths of 600 to 1,100 meters. The underground output, all by full mechanized methods, amounted to 9.2 tons of ore per work day in 1982; total production was 2,250 tons per day at the Rudna Mine. These mines and beneficiation plants were under management of the Copper Mining and Metallurgical complex at Lubin. The Legnica, Glogow I, and Glogow II copper plants (smelters) were also included in the complex. Target capacity of Glogow I was 160,000 tons of electrolytic copper per year, and of Glogow II 150,000 tons per year.

Iron and Steel.—There were 27 steel plants in Poland, with employment of about 170,000. Crude steel production increased by 1.4 million tons in 1983 over that of 1982, and production of rolled steel increased by 1.3 million tons. Crude steel output in 1982 was composed of 5.5 million tons of oxygen steel, 2.0 million tons of electric-furnace steel, and 6.9 million tons of open-hearth steel. Domestic iron ore production was insignificant, since only one small mine was producing 10,000 tons of low-grade siderite ore. Imports of iron ore and concentrates were about 13.8 million tons, of which over 80% came from the U.S.S.R. Imports of pig iron were 1.2 million tons. The Katowice steel plant, which has been in operation for 7 years, was operating profitably. The plant's two 300-ton converters accounted for 30% of Polish production of steel.

The Polish Steamship Co. was to develop a new iron ore handling terminal in Swinoujscie at a cost of $2.3 million.

A major investment in coking coal production was to increase capacity at the Katowice steel plant by 3.3 million tons per year, but a reported lack of equipment at the construction site significantly delayed completion. The first two coke oven batteries were to start in 1986. Another coking plant of 1.1-million-ton-capacity was under construction at Krakow, near Katowice. Two smaller coking coal installations were scheduled to be built also at Krakow. All three plants were to serve the Lenin steel plant at Krakow.

Lead and Zinc.—Deposits of lead-zinc ore occur in several regions, but main lead and zinc production came from the Olkusz region, which has the largest reserves. Ore was obtained from the large Boleslaw, Olkusz, and Pomorzany underground mines and four smaller mines. Zinc metal and zinc products were exported. Of total exports of 28,000 tons of zinc, about 8,000 tons was purchased by centrally planned economy countries and 20,000 tons by market economy countries. Prospecting in the region at Zawiercie and Tarnowskie Gory revealed new zinc and lead deposits.

Silver.—Silver, a byproduct of copper production, continued to be one of Poland's major hard currency earners. The value of silver exports amounted to Z13,601 million in 1983 compared with Z8,012 in 1982. However, production of silver increased only by 21 tons.

NONMETALS

Barite.—Poland's only barite mine, located at Boguszow in Walbrzych Province, increased its output and now fully meets domestic demand. The mine, which is self-financing, has also begun to utilize its waste products. A waste compound is extracted at the sediment ponds and sold to the Chelm cement works in Lubin Province for the manufacture of a special water-resistant cement. Fluorspar was also mined, and was to be recovered from waste sludge, increasing total output to more than 3,000 tons per day.

Sulfur.—Production of sulfur in the Tarnobrzeg area slightly increased, compared with that of 1982. Production included extraction of sulfur ore at the Machow opencast mine, amounting to 1.7 million tons, from which about 400,000 tons of refined sulfur was obtained; the extraction of about 1.2 million tons by the Frasch process at the Jezierko Mine; about 1 million tons at Grzybow; and about 10,000 tons at the Bazina experimental mine. The export outlet was through the port of Gdansk, with crushed sulfur shipped to Morocco and Brazil, and liquid sulfur, to the United Kingdom, France, and the Netherlands. Delay in investment in the long-awaited Bazina Mine made it likely that Polish sulfur exports will drop substantially between 1985 and 1988. Exports to the Western World will suffer most of the decline.

Reserves at Grzybow, 25 kilometers west of Tarnobrzeg and the oldest producing mine, were approaching exhaustion and production was declining. Total remaining reserves at Grzybow were estimated at less than 10 million tons of sulfur. A decision was taken to prolong the life of the mine by reducing production to below 0.5 million tons per year from 1985. Jezierko was the largest Frasch operation mine and had sufficient reserves to produce about 3.5 million tons per year for the next 60 years.

A further Frasch-minable sulfur deposit, comparable in size and quality with the Jezierko Mine, was found at Osiek, about 20 kilometers to the south of Tarnobrzeg. A project at this mine was approved and was awaiting an investment of about $200 million. Output at Osiek was projected at 1.2 to 1.5 million tons per year.

MINERAL FUELS

Coal.—Domestic consumption of coal and the requirements of stockpiling were met in full. About 35 million tons of coal were exported of 191 million tons of bituminous coal produced in 1983. In 1982, Poland had exported a total of 28 million tons of bituminous coal, including 20 million to the West, and earned $749 million from CMEA countries and the West. In the next few years, a stabilization of coal production was envisaged at 190 million tons per year, with lignite production at 60 million tons per year, to be maintained by substantial capital investment.

The official price of coal was lower than the cost of extraction. Subsidies therefore amounted to about Z66 billion in 1982 and about Z88 billion in 1983 and were to go up to Z137 billion in 1984. In 1983, there were 67 bituminous mines in operation. Six new mines were under development, and the extension of three existing mines was underway. A new coal mine in Rybnic, the ninth in the Rybnic Coalfield, was put into preliminary operation in December. Reserves amounted to 240 million tons of bituminous and coking coal, enough for 60 years of exploitation.

Natural Gas.—Production of natural gas, mostly from the Lubaszow Field, was approximately the same as in 1982 and amounted to about 200 billion cubic feet. Several gas wells started production in the Zelona Gova area, including the Jorocin well. Oil and gas prospecting continued in this area. Poland will obtain a sharp increase of 2.5 trillion cubic feet per year in Soviet natural gas deliveries, now about 160 billion cubic feet per year, in payment for Polish labor on the U.S.S.R.'s gas pipeline network. During 1983-85, Polish workers will lay 265 miles of gas pipeline in the Soviet Union, build compressor stations, and provide housing and other infrastructure at a total cost of $237 million.

Petroleum.—Production of crude oil in Poland was relatively insignificant, less than 2% of consumption, and continued to decrease. Prospecting was also reduced. About 100 million barrels of crude oil was imported, mainly from the U.S.S.R., an increase of almost 10 million barrels compared with 1982 imports. About 3.7 million barrels was imported from Iran. In 1983, Poland exported 10 million barrels of petroleum products and synthetic fuels, which was 50% more than that of 1982. There were seven refineries in Poland with total capacity of about 140 million barrels per year.

A Polish, Soviet, and East German consortium continued the exploration of the Baltic Sea. Three wells were drilled into a mid-Cambrian sandstone. One of the wells was completed in 1982 as a gas discovery. In 1983, another well was reported to have found promising shows of oil after reaching about 10,000 feet. Some new fields were discovered in the Carpathian piedmont.

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[1] Foreign mineral specialist, Division of Foreign Data.

[2] Tribuna Ludu (Warsaw). Feb. 3, 1984, pp. 1-4.

[3] Moly Rocznik Statystyczny (Concise Statistical Yearbook of Poland) (Warsaw). 1984, p. 140.

[4] The Polish zloty (Z) is not convertible, and the official exchange rate cannot be used as a measure of relative value. Values given in this chapter are therefore not converted to dollars. The average official exchange rate in 1983 was Z110=US$1.00.

The Mineral Industry of Portugal

By Roman V. Sondermayer[1]

During 1983, Portugal was a modest producer of a number of minerals and related products. Except for tungsten, which shared 3% of total world production, output of other minerals was of only domestic significance. The share of the mineral industry in the gross national product was insignificant. Employment was near 45,000 persons or about 3% of the total labor force.

The development of mineral resources was an important concern of the Government. Major long-range plans for the mineral industry called for development of sulfide deposits in the south; utilization of pyrite with recovery of sulfur, nonferrous metals, and precious metals; production of iron pellets from pyrite cinders; development of iron ore; and modernization of the stone industry. However, these ambitious development plans for the country's mineral industry were again revised and development slowed down during the year. The depression in the world, with consequent difficulties in obtaining capital, were the limiting factors in development of the country's resources.

The principal events related to the mineral industry included continuation of development of the Moncorvo iron ore deposit, but at a slower pace, development of the Neves-Corvo copper mine, and purchasing of equipment for expansion of the steel plant near Seixal.

PRODUCTION

Minerals and related products were produced by both private and Government-owned companies. Most of the large companies were owned or controlled by the Government. Cimentos de Portugal E.P. was the largest producer of cement; Empresa Carbonifera do Douro S.A.R.L. was the only producer of coal; Electrominas, Electrometalurgia S.A.R.L. produced ferroalloys; Ferrominas S.A.R.L. produced iron ore; Petroleos de Portugal was the producer of petroleum refined products; Piritas Alentejanas S.A.R.L. was the largest producer of pyrite; Siderurgia Nacional S.A.R.L. produced iron and steel; Beralt Tin & Wolfram Ltd. was the major producer of tungsten; the Portuguese Atomic Energy Commission produced uranium concentrates; and electrolytic zinc was produced by Quimigel E.P.A., a Government company.

Table 1.—Portugal: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
METALS					
Arsenic, white[e]	345	200	257	200	180
Beryl concentrate, gross weight	5	19	17	12	11
Columbite and tantalite concentrates, gross weight	4	4	12	6	3
Copper:					
Mine output, metal content	3,600	5,200	4,800	500	400
Metal:					
Smelter, primary and secondary[e]	5,500	[r]3,200	[r]3,200	[r]1,500	[2]1,500
Refined, primary and secondary	3,373	[r]4,480	4,800	4,600	4,600
Gold, mine output, metal content troy ounces	[r]10,706	8,855	10,931	6,783	7,000
Iron and steel:					
Iron ore and concentrate:					
Gross weight:					
Hematite and magnetite	22,119	14,773	--	--	--
Manganiferous	37,440	41,850	37,050	27,100	25,000
Total	59,559	56,623	37,050	27,100	25,000
Iron content:					
Hematite and magnetite	15,040	10,046	--	--	--
Manganiferous	13,740	15,359	13,000	9,214	9,000
Total	28,780	25,405	13,000	9,214	9,000
Metal:					
Pig iron thousand tons	366	349	410	215	[2]355
Ferroalloys:					
Ferromanganese[e]	75,000	74,000	65,000	[r]27,100	28,000
Silicomanganese[e]	15,000	17,000	18,000	16,000	16,000
Ferrosilicon[e]	25,000	25,000	24,000	21,000	22,000
Silicon metal[e]	32,000	33,000	32,000	[r]32,000	32,000
Ferrotungsten	200	200	200	212	210
Total[e]	147,200	149,200	139,200	[r]96,312	98,210
Steel, crude thousand tons	649	653	551	504	500
Semimanufactures do	640	650	NA	NA	NA
Lead: Refined, secondary	[r]4,500	[r]5,600	5,300	4,000	3,000
Silver, mine output, metal content troy ounces	35,365	28,935	38,580	23,532	25,000
Tin:					
Mine output, metal content	225	274	351	400	200
Metal, primary and secondary	1,121	938	900	900	300
Titanium: Ilmenite concentrate, gross weight	268	234	334	292	200
Tungsten, mine output, metal content	1,377	[r]1,467	1,395	1,360	1,300
Uranium concentrate: U content	134	95	120	130	120
Zinc: Smelter, primary	--	[e]2,000	4,600	4,200	4,000
NONMETALS					
Barite	704	1,200	1,350	1,300	1,200
Cement, hydraulic thousand tons	5,138	5,748	5,697	5,800	5,500
Clays:					
Kaolin	[e]54,000	[r]83,145	107,968	[r] [e]105,000	100,000
Refractory	[e]100,000	202,899	259,852	[e]250,000	200,000
Diatomite	3,400	2,710	2,690	[e]2,600	2,500
Feldspar	33,808	[r]40,802	44,007	[e]43,000	42,000
Gypsum and anhydrite	[e]200,000	[r]205,378	243,537	[e]250,000	240,000
Lime, hydrated and quicklime thousand tons	261	270	260	[e]250	240
Lithium minerals: Lepidolite	1,000	1,000	[e]900	[e]800	700
Nitrogen: N content of ammonia thousand tons	222	200	133	132	135
Pyrites and pyrrhotite (including cuprous), gross weight do	349	350	287	[e]290	280
Salt:					
Rock do	408	401	408	406	400
Marine do	[e]140	130	120	[e]100	110
Total do	548	531	528	[e]506	510
Sand and gravel:					
Sand do	NA	5,046	5,430	NA	NA
Gravel do	NA	NA	NA	NA	NA
Sodium compounds, n.e.s.:					
Sodium carbonate	182,770	175,000	170,000	[e]170,000	160,000
Sodium sulfate	44,831	52,200	50,000	[e]60,000	50,000

See footnotes at end of table.

Table 1.—Portugal: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Stone:					
Basalt ---- thousand tons	NA	56	124	NA	NA
Calcareous:					
Dolomite ---- do	NA	[r]97	98	NA	NA
Limestone, marl, calcite ---- do	10,541	9,738	12,598	NA	NA
Marble ---- do	324	[r]370	383	NA	NA
Diorite ---- do	NA	[r]1,246	53	NA	NA
Gabbro ---- do	NA	[r]108	73	NA	NA
Granite ---- do	4,796	[r]5,535	5,966	NA	NA
Graywacke ---- do	NA	[r]13	12	NA	NA
Ophite ---- do	NA	44	35	NA	NA
Quartz ---- do	125	125	116	NA	NA
Quartzite ---- do	NA	480	587	NA	NA
Schist ---- do	NA	214	131	NA	NA
Serpentine ---- do	NA	[r]1	--	NA	NA
Slate ---- do	NA	45	NA	NA	NA
Syenite ---- do	NA	8	4	NA	NA
Sulfur:					
Content of pyrites ---- do	151	155	[e]135	116	110
Byproduct, all sources ---- do	1	2	2	2	5
Total ---- do	152	157	137	118	115
Talc	2,727	2,598	6,363	4,940	5,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, anthracite ---- thousand tons	179	177	184	179	180
Coke, metallurgical ---- do	179	140	173	159	160
Fuel briquets, all grades ---- do	247	200	NA	NA	NA
Gas, manufactured ---- million cubic feet	4,900	5,000	NA	NA	NA
Petroleum refinery products:					
Gasoline ---- thousand 42-gallon barrels	8,700	7,140	9,656	7,965	[2]7,360
Jet fuel ---- do	3,696	3,000	4,424	3,408	[2]3,688
Kerosine ---- do	947	900	534	395	[2]271
Distillate fuel oil ---- do	22,402	18,500	15,285	13,800	[2]16,113
Residual fuel oil ---- do	25,669	32,581	22,910	23,596	[2]22,837
Lubricants ---- do	449	500	574	567	600
Liquefied petroleum gas ---- do	2,045	2,000	3,132	2,830	[2]3,016
Naphtha ---- do	(3)	(3)	1,300	2,490	[2]2,346
Unspecified ---- do	[r]4,147	[r]6,000	1,981	3,738	3,215
Refinery fuel and losses ---- do	[e]5,100	5,000	759	410	413
Total ---- do	73,155	75,621	60,555	59,199	59,859

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through July 12, 1984.

[2] Reported figure.

[3] Included with "Unspecified."

TRADE

Portugal remained a net importer of minerals, with fuels topping the list of mineral imports in value. Roughly about 33% of total imports and about 15% of total exports were minerals. The trade in minerals between the United States and Portugal was modest, representing less than 1% of the total trade value of the United States.

Table 2.—Portugal: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Scrap	4,426	4,187	--	Spain 3,073; Netherlands 547.
Unwrought	370	455	--	France 309; Netherlands 100.
Semimanufactures	2,576	3,677	2	Japan 1,821; Poland 394; France 272.
Beryllium: Metal including alloys, all forms	--	20	20	
Copper: Metal including alloys:				
Scrap	17	83	--	Netherlands 40; West Germany 20.
Unwrought	2,884	3,637	--	Netherlands 1,341; Belgium-Luxembourg 1,221.
Semimanufactures	1,291	1,165	497	Belgium-Luxembourg 260; Netherlands 180.
Iron and steel:				
Iron ore and concentrate: Pyrite, roasted	14,315	12,040	--	All to West Germany.
Metal:				
Scrap	4,681	9,149	--	Spain 6,591; Netherlands 2,261.
Pig iron, cast iron, related materials	41	800	--	Netherlands 542; Morocco 250.
Ferroalloys:				
Ferromanganese	26,617	13,890	8,425	Italy 2,562; Greece 1,340.
Unspecified	19,382	35,396	4,542	West Germany 13,316; Greece 7,586.
Semimanufactures	31,089	38,247	1,284	Yugoslavia 5,841; Romania 5,577.
Lead:				
Ore and concentrate	956	1,193	--	All to Belgium-Luxembourg.
Metal including alloys:				
Scrap	19	6	--	All to United Kingdom.
Unwrought	49	23	--	Martinique 20.
Manganese: Ore and concentrate, metallurgical-grade	3,410	450	--	All to West Germany.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$132	$807	$15	West Germany $764.
Tin: Metal including alloys:				
Scrap	--	22	--	Denmark 16; United Kingdom 6.
Unwrought	8	10	--	United Kingdom 9.
Semimanufactures	1	6	--	Angola 5.
Tungsten: Ore and concentrate	2,401	1,727	360	Japan 370; West Germany 359.
Zinc:				
Oxides	1,984	1,427	--	Italy 713; United Kingdom 426.
Metal including alloys:				
Scrap	--	98	--	Netherlands 50; Spain 33.
Semimanufactures	90	214	--	Netherlands 180; Ivory Coast 30.
Other:				
Ores and concentrates	53	25	--	All to Japan.
Oxides and hydroxides	--	208	--	Spain 207.
Ashes and residues	1,825	3,982	--	Spain 2,750; Netherlands 800.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	16,467	7,072	14	United Kingdom 4,410; West Germany 2,647.
Grinding and polishing wheels and stones	243	38	14	France 4; Netherlands 4.
Barite and witherite	--	588	--	All to Spain.
Cement	26,285	13,892	--	Cape Verde 6,327; Guinea-Bissau 4,926.
Chalk	62	132	--	São Tomé and Principe 64; Martinique 45.
Diamond:				
Gem, not set or strung value, thousands	$101,046	$60,985	$159	Switzerland $60,826.
Industrial do	--	$311	$311	
Feldspar, fluorspar, related materials	11,301	4,398	--	France 1,998; United Kingdom 1,300.
Fertilizer materials:				
Crude, n.e.s	70	300	--	All to Spain.
Manufactured, ammonia	275	1	--	All to Guinea-Bissau.
Graphite, natural	176	145	--	Spain 143.
Gypsum and plaster	99	45	--	Cape Verde 17.
Mica:				
Crude including splittings and waste	189	145	--	United Kingdom 139.
Worked including agglomerated splittings	--	40	--	All to United Kingdom.
Phosphate, crude	--	188	--	All to Liberia.
Pigments, mineral: Iron oxides and hydroxides, processed	37	24	--	Cape Verde 20.
Salt and brine	371	724	20	France 579; West Germany 83.
Sodium compounds, n.e.s.: Carbonate, manufactured	1,055	4,012	--	Martinique 3,839.

See footnotes at end of table.

Table 2.—Portugal: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Stone, dimension:				
Crude and partly worked	116,625	115,901	199	Italy 35,391; Spain 31,530.
Worked	193,152	193,422	3,110	West Germany 131,320.
Sulfur, elemental: Crude including native and byproduct	120	61	--	Spain 60.
Talc, steatite, soapstone, pyrophyllite	--	27	--	Angola 13; Martinique 11.
Other:				
Crude	112	151	--	Spain 126; Cape Verde 12.
Slag and dross, not metal-bearing	3,300	1,018	--	France 970.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	725	--	São Tomé and Principe 400.
Petroleum refinery products thousand 42-gallon barrels	6,889	3,981	238	France 506; bunkers 2,025.

[1] Table prepared by Jozef Plachy.

Table 3.—Portugal: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	8,365	7,626	25	United Kingdom 4,787; West Germany 1,392.
Metal including alloys:				
Scrap	403	77	--	Spain 22; United Kingdom 20.
Unwrought	42,348	49,440	--	Spain 21,649; France 9,045.
Semimanufactures	14,087	13,310	70	Spain 2,863; Belgium-Luxembourg 2,173.
Chromium: Ore and concentrate	352	577	--	Republic of South Africa 383.
Columbium and tantalum: Metal including alloys, all forms, tantalum	1	1	--	All from France.
Copper:				
Ore and concentrate	140	7,521	3	Canada 7,499.
Matte and speiss including cement copper	2,565	463	--	Chile 403.
Metal including alloys:				
Scrap	220	222	3	United Kingdom 81; Belgium-Luxembourg 59.
Unwrought	12,757	13,879	126	Belgium-Luxembourg 6,566; Zaire 1,604.
Semimanufactures	16,945	16,732	104	France 6,699; Italy 1,822.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	524,112	262,664	--	Mauritania 91,800; Venezuela 84,781.
Metal:				
Scrap	84,537	124,717	16,599	United Kingdom 70,750; U.S.S.R. 23,968.
Pig iron, cast iron, related materials	74,681	48,535	--	Spain 33,509; West Germany 6,618.
Ferroalloys:				
Ferromanganese	111	160	--	West Germany 96; Belgium-Luxembourg 43.
Unspecified	1,259	1,358	--	United Kingdom 396; Spain 315.
Steel, primary forms	230,680	465,982	--	West Germany 195,877; Belgium-Luxembourg 48,666.
Semimanufactures	516,418	514,349	2,440	West Germany 164,870; France 59,191.
Lead:				
Ore and concentrate	1,500	240	--	Suriname 180; Spain 60.
Metal including alloys:				
Scrap	21	222	--	United Kingdom 123; Senegal 97.
Unwrought	17,808	20,082	519	Peru 7,919; United Kingdom 7,674.
Semimanufactures	7	51	([2])	United Kingdom 37; West Germany 9.
Manganese:				
Ore and concentrate, metallurgical-grade	109,916	122,071	--	Republic of South Africa 58,117; Brazil 35,640; Gabon 28,290.
Oxides	847	1,227	--	Netherlands 521; Greece 286.

See footnotes at end of table.

Table 3.—Portugal: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Mercury 76-pound flasks	841	2,030	--	Turkey 1,334; Spain 377.
Nickel:				
Matte and speiss	39	29	--	Finland 10; Norway 8.
Metal including alloys:				
Scrap	12	26	--	Finland 25.
Unwrought	455	297	--	Canada 71; Switzerland 63; United Kingdom 63.
Semimanufactures	350	629	1	West Germany 455; Finland 80.
Tin:				
Ore and concentrate	63	37	--	All from Thailand.
Metal including alloys:				
Scrap	20	20	--	All from Bolivia.
Unwrought	422	408	--	Bolivia 161; Malaysia 90.
Semimanufactures	56	43	(2)	United Kingdom 29; West Germany 6.
Titanium: Oxides	8,937	9,331	600	United Kingdom 1,842; Spain 1,799.
Tungsten: Metal including alloys, all forms	2	5	--	West Germany 4.
Zinc:				
Ore and concentrate	22	50	--	All from Republic of South Africa.
Metal including alloys:				
Scrap	51	174	--	Angola 151; Belgium-Luxembourg 21.
Unwrought	11,661	10,685	--	Canada 3,729; Belgium-Luxembourg 2,168.
Semimanufactures	1,733	2,229	(2)	West Germany 844; Belgium-Luxembourg 626.
Other:				
Ores and concentrates	2,220	1,991	19	United Kingdom 676; Spain 673.
Base metals including alloys, all forms	253	140	4	Japan 30; China 29; United Kingdom 24.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	900	631	7	Spain 187; Greece 161; Italy 136.
Artificial: Corundum	1,561	1,652	1	West Germany 1,079; Brazil 500.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$867	$1,050	$18	Ireland $467; West Germany $442.
Grinding and polishing wheels and stones	643	500	7	Italy 216; France 68.
Asbestos, crude	18,870	14,396	68	Canada 5,879; Zimbabwe 2,931.
Barite and witherite	2,233	703	--	Spain 324; West Germany 276.
Boron materials: Crude natural borates	10,616	5,410	2,610	Turkey 2,244; Netherlands 365.
Cement	315,532	684,823	478	Spain 681,282.
Chalk	11,193	13,703	--	France 5,776; Spain 5,026.
Clays, crude	43,790	45,415	836	Spain 25,633; United Kingdom 12,829.
Diamond:				
Gem, not set or strung value, thousands	$79,184	$42,579	$6	Switzerland $12,648; unspecified $29,213.
Industrial do	$53	$60	$2	Belgium-Luxembourg $18; West Germany $16.
Diatomite and other infusorial earth	3,823	3,608	353	Spain 1,988; France 798; Italy 231.
Feldspar, fluorspar, related materials	2,423	2,621	--	France 2,251.
Graphite, natural	174	248	8	West Germany 76; Republic of South Africa 48; United Kingdom 43.
Gypsum and plaster	46,958	39,844	2	Spain 36,811; Morocco 2,251.
Magnesite	4,868	5,048	9	United Kingdom 3,301; Austria 458.
Mica: Crude including splittings and waste	464	375	--	Norway 216; United Kingdom 80.
Nitrates, crude	1,087	1,076	--	Chile 1,022.
Phosphates, crude	342,560	396,953	4,488	Morocco 386,359; Senegal 6,100.
Pigments, mineral: Iron oxides and hydroxides, processed	2,008	1,324	--	West Germany 870; Spain 279.
Precious and semiprecious stones other than diamond, synthetic value, thousands	$9	$20	--	Austria $15.
Pyrite, unroasted	2,205	3	--	All from West Germany.
Salt and brine	51,564	43,018	(2)	Italy 37,650; Spain 5,200.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	260	1,145	--	Brazil 756; France 359.
Worked	153	204	--	Belgium-Luxembourg 131; Italy 41.
Dolomite, chiefly refractory-grade	7,588	6,598	--	Italy 2,219; France 2,170.
Gravel and crushed rock	445	251	--	France 108; Spain 101.
Limestone other than dimension	1,500	3,000	--	All from France.
Quartz and quartzite	663	353	--	Belgium-Luxembourg 160; Spain 159.

See footnotes at end of table.

Table 3.—Portugal: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Sulfur:				
Elemental, crude including native and byproduct	117,876	113,481	4	France 104,466; Poland 9,011.
Sulfuric acid	10,090	5,121	215	France 2,955; Belgium-Luxembourg 1,072.
Talc, steatite, soapstone, pyrophyllite	4,076	13,485	--	United Kingdom 5,966; West Germany 5,749.
Other:				
Crude	574	527	(2)	China 199; Spain 171.
Slag and dross, not metal-bearing	55,002	223,003	--	France 187,599; Spain 35,402.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,767	2,314	34	Spain 2,178; West Germany 83.
Carbon: Carbon black	11,234	10,999	111	Spain 6,078; France 3,048.
Coal:				
Anthracite and bituminous	347,952	362,716	284,094	United Kingdom 60,331.
Briquets of anthracite and bituminous coal	--	9,220	6,500	United Kingdom 2,716.
Lignite including briquets	998	960	--	All from West Germany.
Coke and semicoke	68,457	78,378	--	United Kingdom 34,444; Netherlands 22,422.
Peat including briquets and litter	1,142	2,114	17	West Germany 1,121; Netherlands 452.
Petroleum:				
Crude -- thousand 42-gallon barrels	55,224	55,998	--	Saudi Arabia 14,553; Iran 7,939.
Refinery products do.	6,917	16,257	142	Netherlands 2,703; France 2,317.

[1] Table prepared by Jozef Plachy.
[2] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Chromite.—Exploration for chromite was carried out in Vinhais in the north of Portugal by an unnamed British company, and Rio Tinto Zinc Corp. Ltd., United Kingdom, also showed some interest in the area by conducting preliminary prospecting. A significant discovery would be unique in Portugal and Western Europe.

Copper.—Exploration continued at the Neves-Corvo copper mine near Castro Verde in southern Portugal. Approximately 20,000 meters of exploratory drilling was completed. With this additional drilling, reserves at Neves-Corvo reportedly reached 27.5 million tons of copper ore with 8.66% copper and 7.2 million tons of complex ore with 4.5% copper and 2.8% zinc. In addition, 32.9 million tons of lead-zinc ore with 5.71% zinc, 1.48% lead, and 0.48% copper was blocked out. Sinking of a 5-meter-diameter shaft apparently reached a depth of close to 360 meters, out of an ultimate 700 meters. A 17-square-meter ramp at an 18% incline was down to over 874 meters. The studies of the economic aspects of the operation were underway during 1983, but results were not available at yearend.

Iron and Steel.—Ferrominas S.A. continued to explore and perform preliminary work for production and processing of iron ore from the Moncorvo deposit in northern Portugal but at a lower rate than in 1982. The slowdown was attributed to shortage of funds. A 15-ton-per-hour pilot plant for upgrading Moncorvo ore was commissioned in late 1982 and started operation in 1983. The milling is in autogenous mills. Separation is magnetic. A detailed description of the new facility was published.[2]

Plans for expansion of the Seixal steel plant of the Government steelmaker Siderurgia Nacional was delayed because of financial problems. Funding for the civil engineering part of the work, to be carried out by domestic firms, was in the process of being arranged by the Government. Orders were placed with Italimpianti, Italy, for a 1-million-ton-per-year blast furnace, with Voest-Alpine AG, Austria, for two 120-ton LD converters, and a 570,000-ton-per-year Morgan rod mill.

The management of Siderurgia Nacional

expected that completion of construction could be expected in 1988.

Pyrite.—Expansion of the Aljustrel pyrite mine and related facilities continued. The new pilot plant, commissioned in 1982, operated properly during 1983. Total investment for the pilot plant was close to $2 million and capacity was 2 tons of ore per hour. Sulfide deposits in Portugal from which pyrite is recovered contains significant quantities of nonferrous metals. The ore is extremely fine grained and excessive fine grinding would be necessary. The metal content of ore is low, varying from deposit to deposit and from locality to locality in the same deposit. The pilot plant is basically a flotation plant obtaining a bulk concentrate of nonferrous metals, followed by differential concentration of various minerals present in the deposit. After crushing and screening, ore is milled in five mills, one of which is autogenous. The mills operate in closed circuit with hydrocyclones. There are 61 flotation cells, from Sala of Sweden, and five cells from Outokumpu Oy of Finland. A detailed description of the pilot plant was published.[3]

Société Nationale Elf Aquitaine, France; British Petroleum Ltd., United Kingdom; and Billiton Ltd. have acquired large areas in Alentejo Province in southern Portugal for prospecting for pyrite.

Tin.—Near the Spanish border, prospecting for tin was conducted at Almendra near Vila Nova de Foscoa. The Spanish company Cavaso S.A. was the principal prospector.

NONMETALS

Companhia Anglo Portuguesa de Caolinos, affiliated with the British company China Clays Ltd., started production of kaolin in the area near Viana do Castelo. In addition, a new installation for production of coatings operated by the same company started production.

MINERAL FUELS

Exploration for coal was conducted by Ferrominas in the area of the Pajao Mine. A program was also started to drill 12,000 meters of exploratory holes in the Douro carboniferous region in north Portugal. Preparation for production in the lignite area of Rio Maior was underway. Production, expected to start in 1989, would go to a nearby powerplant. This activity of Ferrominas was additional to the work on development of the Moncorvo iron ore deposit.

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[1] Physical scientist, Division of Foreign Data.

[2] Tavares, C., C. Lourenco, L. Santos, and A. Costa. A Lavaria Piloto da Ferrominas, E.P. em Moncourvo (Ferrominas Pilot Plant in Moncorvo). Bol. Minas, v. 20, No. 1, 1983, pp. 2-5 (Engl. sum.).

[3] Neves Ferao Carlos. La Lavaria Piloto da E.D.M.A. (Pilot Plant of E.D.M.A.). Bol. Minas, v. 20, No. 1, 1983, pp. 21-31 (Engl. sum.).

The Mineral Industry of Romania

By Walter G. Steblez[1]

The downward trend of Romania's economy continued into 1983. Centrally planned production goals for a wide range of industrial products were not met, and significant plant shortfalls by yearend were reported for coal, steel, crude oil, and natural gas production. Overall net marketable industrial production reportedly grew 4.8%, and national income increased 3.4%, but the latter was 1.6% below the plan target. The inefficient use of labor reportedly continued during the year in the mining sector with general labor skills and qualifications not on par with the technical level of new machinery at the mine workface. The mining labor force itself was unstable with many new workers reportedly leaving for other employment. There were reported discipline problems in the Jiu Valley area, improper training, and poor equipment repair and maintenance that resulted in substantial losses.

Investment policy stressed completion of ongoing projects rather than development of new ones. New facilities in the coal and copper mining industries were put onstream during the year.

Government Policies and Programs.—The main aim of the Romanian Government was to increase the domestic production base for raw materials and fuels. To this end, the country's geologists were expected to add 100 new deposits for potential exploitation by the end of the 1981-85 5-year plan period. These would include coal, polymetallics, copper, and iron ore, as well as nonmetallic industrial minerals.

The Government's plan for 1984 called for about a 17% increase in steel production, which would allow the industry to work at about full capacity, a 39% increase in coal production, a 12% increase in petroleum extraction, and a 25% increase in the production of copper concentrates. These goals, if measured by past performance, were again unrealistic and would be achieved only at great cost.

PRODUCTION

Romania produced a wide variety of metallic and nonmetallic industrial minerals and fossil fuels but, in most cases, in quantities that were insufficient to meet domestic needs. Although in many cases planned production increases were not met, the mineral industry's production growth appeared to exceed that of other industrial sectors, especially that of coal, copper, and lead. Electric power generated at coal-fired electric power stations increased by 14.4% compared with that of 1982. The production of mining and oil drilling equipment increased by 43% and 66%, respectively, compared with that of 1982.

Table 1.—Romania: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum:					
Bauxite, gross weight	708,000	[e]710,000	712,000	[e]680,000	650,000
Alumina, calcined, gross weight	502,000	534,000	540,000	514,000	500,000
Ingot including alloys:					
Primary	217,000	241,000	242,000	208,000	210,000
Secondary	19,000	18,000	18,000	18,000	23,000
Total	236,000	259,000	260,000	226,000	233,000
Bismuth, mine output, metal content[e]	80	80	80	80	80
Cadmium metal, smelter[e]	90	85	85	80	80
Copper:					
Mine output, metal content[e]	29,000	28,000	27,000	26,000	27,000
Smelter:					
Primary	41,120	40,675	[r] [e]39,450	[e]35,000	34,000
Secondary[e]	4,000	4,000	4,000	4,000	6,000
Total[e]	45,120	44,675	[r]43,450	39,000	40,000
Refined, primary and secondary[e]	42,000	42,000	42,000	40,000	40,000
Gold, mine output, metal content[e] troy ounces	65,000	65,000	65,000	65,000	65,000
Iron and steel:					
Iron ore thousand tons	2,523	2,333	2,304	2,146	2,000
Metal:					
Pig iron do.	8,879	9,012	8,857	8,637	8,700
Steel, crude do.	12,909	13,175	13,025	13,055	12,600
Semimanufactures:					
Castings and forgings, finished do.	1,176	1,220	[e]1,200	[e]1,200	1,100
Pipes and tubes do.	1,500	1,464	[e]1,500	[e]1,500	1,400
Rolled products do.	9,482	9,319	9,600	[e]9,600	9,400
Lead:					
Mine output, metal content	33,300	33,500	[e]33,500	[e]33,500	30,000
Metal, smelter, primary and secondary	40,900	40,991	40,665	45,675	49,300
Manganese:[e]					
Ore:					
Gross weight	80,000	80,000	80,000	80,000	80,000
Metal content	17,000	17,000	17,000	17,000	17,000
Concentrate, gross weight	28,000	28,000	28,000	28,000	28,000
Silver, mine output, metal content thousand troy ounces	965	900	[e]850	[e]850	900
Zinc:					
Mine output, metal content	60,000	60,000	[e]55,000	[e]55,000	50,000
Metal, smelter, primary and secondary	46,486	45,906	45,217	[r] [e]44,000	42,000
NONMETALS					
Barite	81,900	80,000	[e]79,000	[e]78,000	78,000
Cement, hydraulic thousand tons	15,598	15,611	14,746	14,995	15,000
Clays:[e]					
Bentonite	179,000	176,500	176,000	175,000	177,000
Kaolin	90,000	90,000	90,000	90,000	90,000
Diatomite[e]	40,000	40,000	40,000	40,000	40,000
Feldspar[e]	60,000	60,000	60,000	60,000	60,000
Fluorspar[e]	20,000	20,000	20,000	20,000	20,000
Graphite	[e]12,400	12,500	12,500	12,500	12,500
Gypsum	1,870	1,611	1,630	1,630	1,630
Lime thousand tons	3,829	3,813	[e]3,800	[e]3,500	3,400
Nitrogen: N content of ammonia do.	2,335	2,248	2,381	2,217	2,200
Pyrites, gross weight[e] do.	930	930	930	930	930
Salt:					
Rock salt do.	1,650	1,770	[e]1,700	[e]1,700	1,700
Other do.	3,070	3,286	[e]3,300	[e]3,300	3,300
Total do.	4,720	5,056	[e]5,000	[e]5,000	5,000
Sand do.	2,388	2,716	[e]2,800	[e]2,900	2,500
Sodium compounds, n.e.s.:					
Caustic soda do.	704	723	725	[e]720	710
Sodium carbonate, manufactured, 100% Na_2CO_3 basis do.	893	937	[e]970	[e]960	920
Sulfur:[e]					
S content of pyrites do.	400	[r]350	[r]300	[r]200	200
Byproduct, all sources do.	130	140	150	150	150
Total do.	530	[r]490	[r]450	[r]350	350
Sulfuric acid do.	1,750	1,850	1,950	[r]2,000	2,000
Talc[e]	60,000	60,000	60,000	60,000	60,000

See footnotes at end of table.

Table 1.—Romania: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	95,122	101,849	[e]102,000	[e]103,000	[3]103,300
Coal:					
Run-of-mine:					
Anthracite and bituminous thousand tons	9,299	9,686	[e]9,700	[e]9,700	10,618
Brown do.	633	680	[e]700	700	850
Lignite do.	24,956	27,448	[e]27,000	[e]27,500	35,800
Total do.	34,888	37,814	[e]37,400	[e]37,900	47,268
Washed (produced from above):					
Anthracite and bituminous:					
For coke and semicoke production do.	2,205	2,337	[e]2,300	2,224	2,700
For other uses do.	5,903	5,723	[e]5,700	[e]5,700	6,000
Brown do.	601	648	[e]600	674	800
Lignite do.	24,055	26,456	[e]26,000	29,996	29,900
Total do.	32,764	35,164	[e]34,600	38,594	39,400
Coke:					
Metallurgical do.	3,066	3,033	[e]3,000	3,513	[3]4,268
Other do.	385	470	[e]450	[e]450	450
Total do.	3,451	3,503	[e]3,450	3,963	[3]4,718
Fuel briquets (from brown coal) do.	720	730	730	730	750
Gas, natural:					
Gross:					
Associated million cubic feet	242,540	247,732	[e]250,000	[e]250,000	250,000
Nonassociated do.	960,166	994,427	[e]995,000	[e]1,100,000	1,100,000
Total do.	1,202,706	1,242,159	[e]1,245,000	[e]1,350,000	1,350,000
Marketed do.	1,161,100	1,198,683	[e]1,200,000	[e]1,100,000	1,100,000
Petroleum:					
Crude:					
As reported thousand tons	12,323	11,511	[e]11,600	[e]11,700	11,600
Converted thousand 42-gallon barrels	91,843	85,791	[e]86,455	[e]88,452	86,455
Refinery products:[4]					
Gasoline do.	41,514	40,502	[e]40,500	[e]40,000	35,000
Jet fuel and kerosine do.	7,463	6,727	[e]6,700	[e]6,500	6,000
Distillate fuel oil do.	54,301	55,764	[e]55,500	[e]55,000	50,000
Residual fuel oil do.	67,393	68,138	[e]68,000	[e]65,000	60,000
Lubricants do.	5,103	4,648	[e]4,500	[e]4,000	4,000
Liquefied petroleum gas do.	2,285	2,575	[e]2,500	[e]2,000	2,000
Asphalt do.	4,218	4,066	[e]4,000	[e]3,500	3,000
Total do.	182,277	182,420	[e]181,700	[e]176,000	160,000

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Includes data available through Sept. 14, 1984.

[2] In addition to the commodities listed, antimony, asbestos, and a variety of crude construction materials are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

[4] Romanian sources do not indicate whether refinery fuel is reported as a part of the listed product yields. Moreover, additional minor products may be produced but are not listed in official sources.

TRADE

Romania's planned 13.5% growth in trade turnover for 1983 was not realized. The actual increase of 1.4% did little to raise the country's hard currency earnings for the year. Romania continued to rely on imports to meet many fuel and raw material requirements.

The Soviet Union remained Romania's chief trading partner and continued to be an important source of iron ore, coal, petroleum, and natural gas. Romania continued foreign commercial mineral activity with developing countries of Africa, Asia, and Latin America to diversify its sources of fuels and raw materials. In these areas Romania provided technical assistance as well as plants and equipment and was paid back in mineral products.

Table 2.—Romania: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Scrap	4,630	1,120	--	Austria 1,002.
Unwrought[2]	98,200	79,900	--	Poland 31,451; France 4,572.
Semimanufactures	11,538	8,873	759	Japan 5,244; Poland 1,879.
Chromium: Oxides and hydroxides	17	239	151	Jordan 88.
Copper: Metal including alloys:				
Scrap	1,245	704	--	West Germany 354; France 330.
Unwrought	4,009	3,885	--	West Germany 3,865.
Semimanufactures	89	1	--	All to United Kingdom.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	643	869	--	All to West Germany.
Iron and steel: Metal:				
Scrap	604	155	--	All to Italy.
Pig iron, cast iron, related materials	10,176	424	--	Sweden 225.
Ferroalloys:				
Ferrochromium	--	70	--	Sweden 46; Finland 24.
Ferrosilicon	138	2,308	--	West Germany 2,050.
Steel, primary forms	127,640	65,966	--	Yugoslavia 12,231; West Germany 7,931.
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	686	645	([3])	West Germany 114; Egypt 41.
Universals, plates, sheets do	745	727	3	West Germany 75; France 41.
Wire do	112	108	--	West Germany 15; Jordan 2.
Tubes, pipes, fittings do	474	422	39	Poland 49; Hungary 19.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$2,318	$51	--	France $47.
Other:				
Oxides and hydroxides	42	4,231	--	All to Austria.
Ashes and residues	759	10	--	Italy 7.
Base metals including alloys, all forms	70	23	--	Sweden 16; Austria 7.
NONMETALS				
Abrasives, n.e.s.:				
Dust and powder of precious and semiprecious stones including diamond value, thousands	$455	$81	--	Belgium-Luxembourg $72.
Grinding and polishing wheels and stones	52	2	NA	Austria 1.
Barite and witherite	330	365	--	All to France.
Boron: Oxides and acids	260	291	--	West Germany 172; Italy 99.
Cement thousand tons	[4]3,136	[2]3,083	--	Egypt 1,253; Pakistan 79.
Clays, crude	29	621	--	All to West Germany.
Diamond:				
Gem, not set or strung value, thousands	$206	NA		
Industrial do	$484	$59	--	All to Belgium-Luxembourg.
Fertilizer materials: Manufactured:				
Ammonia	33,672	34,902	--	Philippines 15,631; Greece 9,671.
Nitrogenous	[4]1,125,000	[2]1,291,300	--	Poland 96,000; Indonesia 86,625; France 82,122.
Phosphatic	18,886	58,636	--	Indonesia 50,000.
Potassic	--	118	--	All to Italy.
Unspecified and mixed[2]	1,534,900	1,428,200	--	Thailand 39,290; undetermined 1,298,541.
Gypsum and plaster	--	19,905	--	All to Hungary.
Phosphorus, elemental	100	231	--	All to Switzerland.
Pigments, mineral: Iron oxides and hydroxides, processed	9	25	--	All to Greece.
Salt and brine thousand tons	[2]1,001	652	--	Hungary 473; Yugoslavia 179.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	[4]566,000	[2]443,400	--	Hungary 59,009; Czechoslovakia 47,000; Yugoslavia 45,091.
Sulfate, manufactured	--	15,433	--	Egypt 15,033.
Stone, sand and gravel: Dimension stone:				
Crude and partly worked	1,352	2,535	--	All to Hungary.
Worked	15,051	11,228	NA	West Germany 9,642.
Sulfur: Sulfuric acid	--	97	--	All to Yugoslavia.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	804	4	--	All to Italy.
Carbon: Carbon black[2]	27,000	21,500	--	Poland 8,001; Czechoslovakia 3,084.
Gas, natural: Gaseous million cubic feet	7,063	7,063	--	All to Hungary.
Peat including briquets and litter	1,943	643	--	All to Austria.

See footnotes at end of table.

Table 2.—Romania: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Destinations, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum:				
Crude thousand 42-gallon barrels	162	NA		
Refinery products:				
Liquefied petroleum gas do.	(3)	66	--	Italy 52; Netherlands 12.
Gasoline do.	[4]29,895	[2]23,588	2,317	West Germany 1,795; France 1,437.
Mineral jelly and wax do.	1	44	--	NA.
Kerosine and jet fuel do.	16	27	--	Hungary 18; West Germany 9.
Distillate fuel oil do.	[4]16,173	[2]10,562	--	Italy 5,871; Yugoslavia 214.
Lubricants do.	[4]1,659	[2]1,816	--	Austria 261; undetermined 1,467.
Residual fuel oil do.	[4]13,460	[2]12,707	--	France 4,249; Italy 3,397.
Bitumen and other residues do.	[2]138	20	--	Austria 16.
Petroleum coke[2] do.	855	583	--	Yugoslavia 56; undetermined 526.

[p] Preliminary. NA Not available.

[1] Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Romania, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2] Official Trade Statistics of Romania.

[3] Less than 1/2 unit.

[4] Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

Table 3.—Romania: Apparent imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	435,595	580,502	--	Greece 510,671.
Oxides and hydroxides	18,538	11,675	--	Hungary 5,861; Netherlands 4,344.
Metal including alloys:				
Unwrought	1,590	1,902	--	Hungary 1,899.
Semimanufactures	3,048	2,100	--	Hungary 867; West Germany 606.
Chromium: Ore and concentrate	1,191	1,502	--	Finland 860; West Germany 642.
Cobalt:				
Oxides and hydroxides	50	38	--	France 28.
Metal including alloys, all forms	23	28	9	France 11.
Copper: Metal including alloys:				
Unwrought	26,339	20,790	--	Poland 17,589.
Semimanufactures	10,632	9,381	5	Poland 6,636; West Germany 1,199.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	301	451	--	All from West Germany.
Iron and steel:				
Iron ore and concentrate: Pyrite, roasted thousand tons	15,016	[2]14,398	--	U.S.S.R. 7,780.
Metal:				
Pig iron, cast iron, related materials	286,000	[2]285,400	--	NA.
Ferroalloys:				
Ferrochromium	4,824	915	--	West Germany 815.
Ferromanganese	55,000	63,000	--	NA.
Ferrosilicomanganese	15,539	NA		
Ferrosilicon	--	29	--	All from West Germany.
Silicon metal	402	NA		
Unspecified[2]	73,457	99,756	--	NA.
Steel, primary forms	169,000	171,000	--	NA.
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	356	304	--	Hungary 31; undetermined 229.
Universals, plates, sheets do.	213	233	--	West Germany 21; undetermined 142.
Hoop and strip do.	29	18	--	West Germany 16.
Rails and accessories do.	84	105	--	Yugoslavia 14; undetermined 91.
Wire do.	28	20	--	West Germany 3; undetermined 15.
Tubes, pipes, fittings[2] do.	96	60	NA	West Germany 10; Czechoslovakia 8.
Castings and forgings, rough do.	3	14	--	NA.

See footnotes at end of table.

Table 3.—Romania: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982^{p}	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides	2,340	1,495	--	Italy 757; France 738.
Metal including alloys, unwrought	5,004	^{3}4,900	--	NA.
Magnesium: Metal including alloys:				
Unwrought	^{4}496	NA		
Semimanufactures	29	63	--	West Germany 59.
Manganese: Ore and concentrate, metallurgical-grade	213,000	174,000	--	NA.
Mercury 76-pound flasks	261	58	--	All from Netherlands.
Nickel: Metal including alloys:				
Unwrought	200	345	--	France 200; Finland 113.
Semimanufactures	247	191	--	France 79; West Germany 71.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$4,020	$1,493	--	All from West Germany.
Silver: Ore and concentrate do	$197	$172	--	France $88; West Germany $29.
Titanium:				
Ore and concentrate	--	2,240	--	All from Netherlands.
Oxides	3,282	1,284	--	Yugoslavia 1,000.
Vanadium: Oxides and hydroxides	NA	283	--	All from Finland.
Zinc:				
Ore and concentrate	^{5}20,000	9,134	9,134	
Oxides	3,083	3,843	--	Yugoslavia 1,365; Italy 1,363.
Metal including alloys:				
Unwrought	8,198	^{3}6,900	--	Finland 2,000; undetermined 4,900.
Semimanufactures	2,355	1,967	--	West Germany 1,129.
Zirconium: Ore and concentrate	95	40	--	All from West Germany.
Other:				
Oxides and hydroxides	311	13,803	--	Austria 13,787.
Base metals including alloys, all forms	338	31	--	United Kingdom 19.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	164	110	--	All from Italy.
Artificial: Corundum	5,131	5,202	--	Yugoslavia 3,396; Hungary 1,393.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$447	$254	$103	Belgium-Luxembourg $151.
Grinding and polishing wheels and stones	^{6}2,457	1,251	--	Yugoslavia 218; France 210.
Asbestos, crude	2,905	10	--	Italy 9.
Barite and witherite	13,560	3,800	--	All from Thailand.
Boron: Oxides and acids	460	271	--	Yugoslavia 270.
Cement	5,002	30	--	All from Austria.
Clays, crude:				
Kaolin	11,260	4,729	--	France 3,200.
Unspecified	4,833	11,767	--	United Kingdom 8,108.
Diamond:				
Gem, not set or strung value, thousands	$7	$109	--	All from Belgium-Luxembourg.
Industrial do	$10,739	$5,529	--	Belgium-Luxembourg $2,988; United Kingdom $2,540.
Diatomite and other infusorial earth	1,231	520		France 490.
Feldspar, fluorspar, related materials	3,020	2,640	--	Italy 2,545.
Fertilizer materials: Manufactured:				
Nitrogenous	7	105	--	All from West Germany.
Phosphatic	32	33	33	
Potassic[2]	543,991	754,808	--	East Germany 453,125; U.S.S.R. 188,808.
Unspecified and mixed	103	9,006	--	Austria 8,466.
Graphite, natural	107	47	--	All from West Germany.
Magnesium compounds:				
Magnesite	23,052	20,000	--	All from Czechoslovakia.
Oxides and hydroxides	44	80	--	All from West Germany.
Other	63	4,011	--	Austria 2,011; Greece 2,000.
Mica:				
Crude including splittings and waste	37	298	121	United Kingdom 111; Italy 60.
Worked including agglomerated splittings	17	9	--	All from West Germany.
Phosphates, crude[2] thousand tons	2,414	2,083	125	Jordan 810.
Pigments, mineral: Iron oxides and hydroxides, processed	605	597	--	West Germany 391; Japan 204.
Stone, sand and gravel:				
Gravel and crushed rock	987	183	3	United Kingdom 100.
Quartz and quartzite	1,089	110	--	Sweden 100.
Sand other than metal-bearing	613	4,880	--	Italy 2,500; West Germany 2,360.

See footnotes at end of table.

Table 3.—Romania: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Sulfur:				
Elemental, crude including native and byproduct	375,341	270,967	49,623	Poland 221,000.
Sulfuric acid	3,902	1,659	--	Hungary 1,627.
Talc, steatite, soapstone, pyrophyllite	2,645	114	--	Italy 80.
Other: Crude	1,773	2,217	--	Greece 1,000; Italy 674.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	40	27	--	Italy 26.
Carbon: Carbon black	242	42	--	West Germany 17.
Coal:				
Anthracite and bituminous[2] thousand tons	3,769	3,631	359	Poland 1,346; Czechoslovakia 338.
Lignite including briquets do	29	22	--	All from Yugoslavia.
Coke and semicoke do	[7]3,448	[2]2,614	--	United Kingdom 473; Japan 343; Italy 250.
Petroleum:				
Crude thousand 42-gallon barrels	[7]93,912	[2]80,838	--	Kuwait 4,899; undetermined 71,582.
Refinery products:				
Liquefied petroleum gas 42-gallon barrels	62,211	82	2	United Kingdom 80.
Gasoline do	11,603	7,905	--	West Germany 3,179; Italy 2,210.
Mineral jelly and wax do	4,832	4,337	--	Hungary 3,935; West Germany 205.
Kerosine and jet fuel do	11,424	4,278	--	West Germany 2,465; Hungary 613.
Distillate fuel oil do	4,424	515	--	West Germany 314.
Lubricants do	24,460	37,450	1,696	West Germany 26,446; Italy 2,345.
Residual fuel oil do	140,093	1,066	--	All from Greece.
Bituminous mixtures do	42	261	--	Italy 243.

[p] Preliminary. NA Not available.

[1] Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Romania, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2] Official Trade Statistics of Romania.

[3] World Metal Statistics, World Bureau of Metal Statistics, London, United Kingdom.

[4] Excludes exports from Norway valued at $803,000.

[5] Lead and Zinc Statistics, International Lead and Zinc Study Group, London, United Kingdom.

[6] Excludes quantity valued at $995,000.

[7] Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

COMMODITY REVIEW

METALS

Copper.—The major event in the copper industry was the operational startup of the Rosia Poieni copper concentrator, with a daily throughput of 1,000 tons. The concentrator would apparently process 12 million tons of very low-grade ore to produce 20,000 tons per year of concentrate with about 1,600 tons of metal content. To date, Rosia Poieni, Romania's largest and newest copper mining facility in the Apuseni Mountains, excavated 34 million tons of rock overburden.

The poor grade ore was reported to contain sufficient molybdenum to warrant extraction. A new electrochemical procedure developed by the Deva Ore Research, Technological Engineering and Design Institute claimed a 90% extraction efficiency without affecting other components in the ore.

Iron and Steel.—With decreasing reserves of iron ore, which supplied only a fraction of domestic needs, Romania had to rely on imports to supply its 14-million-ton-per-year steel industry. Most of the imported ore came from the Soviet Union with additional supplies coming from Brazil, India, and other developing countries. Although a net exporter of steel in tons, paradoxically, Romania was a net importer in value. This was due to the industry's inability to produce special grades of steel to satisfy domestic users. Low productivity and dated technology were among the reasons given for this condition.

During the year, Romania and Brazil held discussions over a possible joint venture to construct an iron ore port at Constanza at the mouth of the Danube. If built, the port would accommodate carriers of up to 150,000 tons deadweight capacity and would transship Brazilian iron ore by barge to East European users along the Danube. In turn, Romania would provide equipment and technical assistance for coal development in Brazil.

Lead and Zinc.—Local mining satisfied about 75% of domestic lead and 70% of domestic zinc requirements. Mining and beneficiation was centered at the Baia Mare mining complex and the smelter was at Copsa Mica in central Romania. The production of lead increased by 7.9% and reportedly, that of zinc decreased in 1982.

NONMETALS

Romania mined and processed a wide variety of nonmetallic industrial minerals mainly for domestic use. These included barite, bentonite, feldspar, graphite, and sulfur.

MINERAL FUELS

Coal.—Reportedly, the expansion of the Tahomir Mine in the Motru Coalfield by 250,000 tons per year was completed. In addition, the new Rosia-Pesteana Mine would produce 200,000 tons per year at full capacity. The industry continued to experience difficulties with obtaining spare parts, equipment, and skilled labor, as well as with rising production costs.

Petroleum and Natural Gas.—The production plan for petroleum and natural gas was not met and production remained at about the level of 1982. Plans for 1984 were to increase petroleum output by 19 million barrels and that of natural gas by 11.82 million cubic feet.

New discoveries of petroleum were reported at Stoina Ciumeghiu, Mihai Bravu, Ileana, and Vilcele; also, a small offshore Black Sea petroleum operation was planned for 1984. Imports of petroleum were mainly from the Soviet Union at hard currency prices.

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[1] Foreign mineral specialist, Division of Foreign Data.

The Mineral Industry of Saudi Arabia

By John R. Lewis[1]

Reduced petroleum demand, created by a steady decline in international petroleum consumption, sharply depressed Saudi Arabia's export earnings in 1983 and forced the kingdom to call upon its huge financial reserve to meet its Government expense requirements. The kingdom's budget was down from a projected $90.8 billion[2] for the year and was finally approved at $75.4 billion. Revenue was projected to be $65.2 billion with a remaining $10.2 billion to come from reserves.

Crude petroleum export was Saudi Arabia's only major source of income. To balance expenses, oil had to be produced at between 5 and 6 million barrels per day. For the first quarter of the year, average daily oil production was 4.1 million barrels; near the end of March, there were days when production was down to 3.5 million barrels. Thus, the kingdom drew heavily upon its financial reserves to keep its economy viable.

The oil sector generated about one-half of the gross domestic product (GDP), 90% of all Government revenue, and practically all of the kingdom's export earnings. A cutback from 9.8 million barrels per day in 1981 to 3.5 million barrels per day in the spring of 1983 had a very perceptible impact. However, owing to a sound financial base, economic growth continued. Some development projects, such as a $344 million water desalinization plant, were canceled while a related $437 million powerplant was placed on hold. There was also some reluctance to complete a $2.6 billion export oil refinery at Rabigh on the Red Sea.

Meanwhile, pilot plant work on the iron ores of Wadi Sawawin continued; the ancient gold workings at Mahd adh Dhahab moved closer to reopening and commercial exploitation; and the kingdom's integrated steelworks (Hadeed) in the industrial city of Jubail started production during the year and had an annual capacity of 800,000 tons of finished steel.

PRODUCTION AND TRADE

The production and export of crude oil and some of its products provided 51% of the Saudi Arabian GDP in 1983, compared with 65% of the GDP in 1982 and 70% in 1981. Industry and agriculture steadily increased contributions to the GDP owing to the Government's emphasis on nonoil sector development. Oil earnings funded the extensive expansion of the nonoil economy, including development of the steel industry, some mine development, and considerable mineral exploration work.

Lower demand for Saudi Arabia's crude oil during the year resulted from factors such as reduced drawdown of petroleum stocks by major oil-importing countries, continued sluggishness in worldwide economic activity, and energy conservation measures in oil-consuming countries. The kingdom's position as the swing producer among the Organization of Petroleum Exporting Countries (OPEC) members also reduced crude production down to about 5 million barrels per day in 1983 from 6.5

million barrels per day in 1982 and 9.8 million barrels per day in 1981. These drastic cutbacks resulted in the disappearance of the kingdom's trade surpluses and created rising trade deficits that were not a problem because of the country's tremendous financial reserves.

Oil exports, which provided about 90% of Saudi Arabia's foreign exchange, continued to diminish while imports of foodstuffs, textiles, building materials, motor vehicles, machinery, appliances, and miscellaneous items rose markedly. The resulting trade deficit of $15 billion, up from $1 billion in 1982, was covered by drawing on the country's extensive monetary reserves.

Table 1.—Saudi Arabia: Production of mineral commodities[1]

Commodity	1979	1980	1981	1982[p]	1983[e]
METALS					
Iron and steel: Steel, crude thousand metric tons	45	50	72	70	[2]275
NONMETALS					
Cement, hydraulic[3] do.	[r]2,548	[r]2,911	4,735	7,153	[2]8,126
Gypsum do.	75	80	95	[2]91	[2]1
Lime[e] do.	150	150	175	170	[2]9
Nitrogen: N content of ammonia do.	155	167	170	[2]207	225
Sulfur:					
Native metric tons	1,100	1,000	NA	NA	NA
Byproduct, all sources do.	125,000	460,000	600,000	900,000	800,000
Total do.	126,100	461,000	600,000	900,000	800,000
MINERAL FUELS AND RELATED MATERIALS[4]					
Gas, natural:					
Gross million cubic feet	1,888,752	1,935,407	1,880,071	1,200,000	1,000,000
Marketed[e] do.	400,000	450,000	500,000	400,000	383,500
Natural gas liquids: All forms thousand 42-gallon barrels	[r]112,900	[r]135,139	163,582	159,769	125,000
Petroleum:					
Crude do.	3,479,389	3,613,683	3,579,920	2,309,428	[2]1,834,100
Refinery products:					
Gasoline do.	21,316	26,043	29,000	39,000	50,000
Jet fuel do.	[r]2,480	[r]11,800	13,500	16,700	17,000
Kerosine do.	9,913	12,526	1,500	1,500	1,500
Distillate fuel oil do.	34,991	[r]47,700	[e]46,000	66,975	[2]84,900
Residual fuel oil do.	97,997	89,048	[e]90,000	93,748	90,000
Liquefied petroleum gas do.	79,523	97,339	[e]100,000	57,243	50,000
Naphtha do.	51,250	45,560	[e]47,000	36,850	32,000
Asphalt do.	7,937	8,268	[e]8,300	14,125	16,000
Unspecified do.	1,560	1,600	[e]1,700	2,000	3,000
Refinery fuel and losses[e] do.	10,200	10,200	10,500	10,000	9,000
Total do.	[r]317,167	[r]350,084	[r] [e]347,500	338,141	353,400

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through Aug. 24, 1984.

[2] Reported figure.

[3] Data are for the Hejira calendar year, which corresponds closely to the Gregorian calendar year.

[4] Includes Saudi one-half share of production in the Kuwait-Saudi Arabia Partitioned Zone.

Table 2.—Saudi Arabia: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	124	2	--	Bahrain 1; Yemen (Sanaa) 1.
Metal including alloys:				
Scrap	4,122	6,946	--	Kuwait 3,395; Pakistan 1,044.
Unwrought	526	62	--	Netherlands 22; Italy 20.
Semimanufactures	332	244	--	Yemen (Sanaa) 154; Greece 36.
Copper:				
Matte and speiss including cement copper	504	110	--	Kuwait 88; West Germany 22.
Metal including alloys:				
Scrap	6,672	8,013	--	Spain 2,229; Kuwait 2,148; West Germany 1,186.
Unwrought	263	2	--	All to Yemen (Sanaa).
Semimanufactures	35	152	--	Netherlands 40; West Germany 30.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	5,851	--		
Iron and steel:				
Iron ore and concentrate: Pyrite roasted	--	2,000	--	All to United Arab Emirates.
Metal:				
Scrap	52,193	28,680	--	Qatar 18,080; Lebanon 2,769; Pakistan 1,875.
Pig iron, cast iron, related materials	^{r}796	269	--	Pakistan 145; Republic of Korea 40; Kuwait 17.
Steel, primary forms	129	98	--	Yemen (Sanaa) 91; United Arab Emirates 7.
Semimanufactures:				
Bars, rods, angles, shapes, sections	3,566	2,561	--	Qatar 765; Lebanon 534; Yemen (Sanaa) 431.
Universals, plates, sheets	^{r}2,562	2,452	--	Yemen (Sanaa) 2,284.
Hoop and strip	32	17	--	All to Iraq.
Rails and accessories	83	455	--	Iraq 392; Qatar 23.
Wire	24	50	--	Iraq 32; Jordan 9.
Tubes, pipes, fittings	^{r}7,378	4,498	11	United Arab Emirates 1,455; Yemen (Sanaa) 1,058.
Castings and forgings, rough	372	--		
Lead: Metal including alloys:				
Scrap	22	1,092	--	Lebanon 120; Republic of Korea 117; Kuwait 47.
Semimanufactures	10	4	--	Iraq 2; Egypt 1.
Magnesium: Metal including alloys, unwrought	--	47	--	All to West Germany.
Tungsten: Metal including alloys, all forms	54	--		
Zinc:				
Ore and concentrate	--	107	--	Republic of Korea 102; Yemen (Sanaa) 5.
Metal including alloys:				
Scrap	9	240	--	Japan 100; Syria 57.
Unwrought	218	193	--	Republic of Korea 136; Somalia 48.
Semimanufactures	^{r}502	467	--	Yemen (Sanaa) 254; Republic of Korea 136.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	17	--		
Grinding and polishing wheels and stones	27	23	--	Yemen (Sanaa) 15; Kuwait 6.
Asbestos, crude	21	798	--	Sudan 469; Iraq 220.
Cement	7,758	527,301	--	Qatar 143,773; Iraq 52,189; Bahrain 41,391.
Clays, crude: Unspecified	51	88	--	United Arab Emirates 40; Jordan 30.
Diatomite and other infusorial earth	163	81	--	Qatar 43; Bahrain 28.
Fertilizer materials:				
Crude, n.e.s	1,120	542	--	Iraq 397; Jordan 115.
Manufactured:				
Ammonia	92	2	--	Bahrain 1; Yemen (Sanaa) 1.
Nitrogenous	288,150	340,764	--	Iraq 96,202; China 49,790; Bangladesh 49,350.
Phosphatic	3,680	4,473	--	Yemen (Sanaa) 2,726; Jordan 1,454.
Unspecified and mixed	^{r}167	38	--	United Arab Emirates 32; Yemen (Sanaa) 5.
Graphite, natural	21	25	--	All to Yemen (Sanaa).

See footnotes at end of table.

Table 2.—Saudi Arabia: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Gypsum and plaster	20,806	38,361	--	Kuwait 36,124; Qatar 695; Bahrain 48.
Lime	2,859	3,991	--	Yemen (Sanaa) 3,481.
Nitrates, crude	5,243	7	--	All to Iraq.
Pigments, mineral: Iron oxides and hydroxides, processed	21	31	--	United Arab Emirates 17; Egypt 14.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$23	--		
Synthetic do.	$35	--		
Pyrite, unroasted	28	7	--	All to Yemen (Sanaa).
Salt and brine	6,646	2,000	--	All to United Arab Emirates.
Sodium compounds, n.e.s.: Carbonate, natural and manufactured	--	8	--	All to Yemen (Sanaa).
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	3,512	1,116	--	France 1,034; Yemen (Sanaa) 77.
Worked	634	3,161	--	United Arab Emirates 1,811; Yemen (Sanaa) 730.
Gravel and crushed rock	123,285	182,651	--	Kuwait 181,813.
Limestone other than dimension	30	45	--	All to Qatar.
Sand other than metal-bearing	1,656	364	--	United Arab Emirates 240.
Sulfur:				
Elemental:				
Crude including native and byproduct	280	131	--	Yemen (Sanaa) 124.
Colloidal, precipitated, sublimed	32	415,946	--	India 214,550; Tunisia 64,893.
Sulfuric acid	142	234	--	Qatar 124; West Germany 24.
Other:				
Crude	287	3,660	--	Qatar 194; Iraq 130; unspecified 3,273.
Slag and dross, not metal-bearing	1,610	--		
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	[r]24,166	14,760	--	United Arab Emirates 13,128; Qatar 978.
Carbon: Carbon black	6	13	--	All to Yemen (Sanaa).
Coal:				
Anthracite	354	7	--	Bahrain 4; Qatar 1; Yemen (Sanaa) 1.
Briquets of anthracite and bituminous coal	--	219	--	All to Yemen (Sanaa).
Lignite including briquets	35	33	--	Do.
Gas, natural: Gaseous million cubic feet	559,363	578,688	4,330	Japan 359,515; Kuwait 41,078; Netherlands 35,059.
Petroleum:				
Crude thousand 42-gallon barrels	3,298,163	2,024,172	161,114	Japan 455,875; France 188,762; Singapore 108,317.
Refinery products:				
Liquefied petroleum gas do.	[r]123,401	127,286	90	Japan 79,310; Kuwait 9,060; Netherlands 7,731.
Gasoline: Motor do.	[r]45,636	34,902	5,751	Japan 17,879; France 2,948; Brazil 2,577.
Mineral jelly and wax do.	--	(2)	--	All to Yemen (Sanaa).
Kerosine and jet fuel do.	716	33	--	Yemen (Sanaa) 32.
Distillate fuel oil do.	[r]5,857	16,637	571	Singapore 7,081; Japan 2,318; Brazil 1,528.
Lubricants do.	130	506	20	United Arab Emirates 163; Sudan 46; Netherlands 43.
Residual fuel oil do.	[r]19,622	18,876	1,277	Singapore 2,078; Japan 2,016; Netherlands 1,139.
Bitumen and other residues do.	[r]208	7	--	Yemen (Sanaa) 6.

[r] Revised.

[1] Table prepared by Virginia A. Woodson.

[2] Less than 1/2 unit.

Table 3.—Saudi Arabia: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Alkaline- and rare-earth metals:				
Unspecified	2,799	1,500	372	Sweden 204; Belgium 202; Spain 180.
Aluminum:				
Ore and concentrate	39,509	114,856	--	All from India.
Oxides and hydroxides	5,610	541	217	India 180; Italy 69.
Metal including alloys:				
Scrap	206	63	1	Greece 27; Republic of Korea 25.
Unwrought	7,852	6,318	18	Bahrain 3,665; Canada 1,149; United Kingdom 963.
Semimanufactures	40,444	44,446	4,832	Greece 10,320; Republic of Korea 7,537; Bahrain 2,689.
Arsenic: Metal including alloys, all forms	--	98	NA	West Germany 21; France 14.
Cobalt: Oxides and hydroxides	10	74	2	India 49; United Kingdom 22; West Germany 1.
Columbium and tantalum: Metal including alloys, all forms, tantalum	4	18	(2)	Japan 15.
Copper: Metal including alloys:				
Scrap	1,049	215	--	Yemen (Sanaa) 14.
Unwrought	11	39	(2)	United Kingdom 15.
Semimanufactures	15,870	26,459	3,414	Australia 10,427; Japan 3,865; United Kingdom 3,332.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	426,768	638,995	NA	Switzerland 337,615; Bahrain 104,329; Czechoslovakia 49,062.
Iron and steel: Iron ore and concentrate:				
Excluding roasted pyrite	42,565	95,695	--	Brazil 40,282; India 28,402; Greece 26,955.
Metal:				
Scrap	424	1,278	295	Japan 663; United Arab Emirates 88; France 56.
Pig iron, cast iron, related materials	68,640	196,940	201	Sweden 66,767; Brazil 41,310; Greece 27,228.
Ferroalloys	346	356	61	Norway 100; Japan 69; West Germany 35.
Steel, primary forms	98,999	229,385	2,604	Australia 50,266; Japan 38,284; Finland 26,349.
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	1,913	3,362	29	Japan 1,940; Republic of Korea 544; Qatar 211.
Universals, plates, sheets	381,216	735,746	12,451	Japan 573,426; Republic of Korea 46,254; West Germany 36,150.
Hoop and strip	15,315	10,503	387	Japan 6,315; Italy 715; United Kingdom 962.
Rails and accessories	23,421	73,328	685	West Germany 23,630; Australia 18,918; United Kingdom 13,350.
Wire	30,035	55,422	242	Japan 17,879; Republic of Korea 10,918; France 10,291.
Tubes, pipes, fittings	895,245	1,032,310	97,255	Japan 419,516; West Germany 132,848; India 83,921.
Castings and forgings, rough	r109,353	48,382	14,429	West Germany 6,656; France 4,747; United Kingdom 4,194.
Lead:				
Ore and concentrate	97	313	--	Morocco 278; France 19; North Korea 15.
Oxides	63	247	38	West Germany 64; Cyprus 52; Netherlands 15.
Metal including alloys:				
Scrap	171	1,044	--	West Germany 421; Kuwait 366; Jordan 179.
Unwrought	929	892	32	Kuwait 311; United Kingdom 200; West Germany 108.
Semimanufactures	2,347	2,538	218	West Germany 1,051; Lebanon 337; Italy 228.
Magnesium: Metal including alloys:				
Unwrought	13	--		
Semimanufactures	4	155	4	United Kingdom 151.
Manganese:				
Ore and concentrate	49	2,605	--	Norway 2,098; India 500; United Kingdom 6.
Oxides	113	31	--	West Germany 23.
Mercury 76-pound flasks	2,415	348	232	West Germany 87.
Molybdenum:				
Ore and concentrate[3]	--	789	155	Belgium-Luxembourg 207; Netherlands 88; United Kingdom 74.
Metal including alloys, all forms	18	14	13	NA.

See footnotes at end of table.

Table 3.—Saudi Arabia: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Nickel: Metal including alloys, semimanufactures	177	288	12	Italy 114; Japan 44; West Germany 34.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$89	$19	$3	West Germany $10; Italy $3; United Kingdom $3.
Silver: Metal including alloys, unwrought and partly wrought[4] troy ounces	430,787	104,683	NA	Switzerland 49,866; Austria 32,151.
Tin: Metal including alloys:				
Scrap	16	55	--	Japan 34; Singapore 8.
Unwrought	39	38	(2)	Singapore 11; India 10; Malaysia 10.
Semimanufactures	2,144	1,328	246	Japan 897; Belgium-Luxembourg 69; Singapore 44.
Titanium: Oxides	2,876	3,184	666	Belgium-Luxembourg 733; United Kingdom 584; West Germany 423.
Uranium and/or thorium: Metal including alloys, all forms value, thousands	$51	$84	$20	Turkey $29; Japan $24; India $10.
Zinc:				
Ore and concentrate	423	242	101	Czechoslovakia 90; Singapore 50; United Kingdom 1.
Oxides	815	686	10	West Germany 175; Czechoslovakia 127; Thailand 105.
Metal including alloys:				
Unwrought	1,008	1,861	18	Japan 1,232; Belgium-Luxembourg 400; West Germany 100.
Semimanufactures	10,371	16,715	419	Japan 11,116; Belgium-Luxembourg 1,605; West Germany 994.
Other:				
Ores and concentrates	1,022	198	38	France 113; Netherlands 16; United Kingdom 15.
Base metals including alloys, all forms	134	229	6	Republic of Korea 107; Italy 56.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	37,642	17	NA	West Germany 2; India 15.
Artificial: Corundum	9	2	(2)	Japan 1.
Grinding and polishing wheels and stones	3,330	3,352	109	Italy 1,552; West Germany 382; Japan 243.
Asbestos, crude	10,102	15,882	165	Canada 5,552; Botswana 3,513; Cyprus 2,574.
Barite and witherite	26,597	46,699	27,667	Thailand 12,452; India 5,934; Sweden 400.
Boron materials:				
Crude natural borates	--	27	--	Mainly from Japan.
Oxides and acids	41	60	17	West Germany 41; France 1; United Kingdom 1.
Cement thousand tons	9,455	10,612	15	Spain 3,822; Japan 2,895; Greece 2,302.
Chalk	3,426	3,445	44	Belgium-Luxembourg 1,336; France 551; Czechoslovakia 251.
Clays, crude:				
Andalusite, kyanite, sillimanite	1,579	3,582	462	Bulgaria 2,595; West Germany 300; India 201.
Fire clay	36,254	30,171	17,571	India 6,992; Bulgaria 2,500; United Kingdom 1,113.
Cryolite and chiolite	81	38	--	Netherlands 20; Belgium-Luxembourg 18.
Diamond:				
Gem, not set or strung value, thousands	$10,288	$1,914	$19	Belgium-Luxembourg $809; India $595; Lebanon $346.
Industrial do	$4,200	$145	--	Belgium-Luxembourg $75; Switzerland $5.
Diatomite and other infusorial earth	37,297	49,756	24,705	China 16,148; Greece 7,000; Finland 381.
Feldspar, fluorspar, related materials	697	965	--	West Germany 901.
Fertilizer materials:				
Crude, n.e.s	30,078	28,666	499	West Germany 21,550; France 2,371; Netherlands 843.
Manufactured:				
Ammonia	691	727	133	Netherlands 191; Kuwait 128; United Kingdom 94.

See footnotes at end of table.

Table 3.—Saudi Arabia: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials —Continued				
Manufactured —Continued				
Nitrogenous	29,378	44,905	1,892	Netherlands 17,531; Italy 8,983; France 7,989.
Phosphatic	32,965	47,575	1,000	Lebanon 11,319; West Germany 10,687; France 8,250.
Potassic	4,245	7,936	3,036	Netherlands 3,040; France 622; Belgium-Luxembourg 600.
Unspecified and mixed	4,556	18,948	1,672	Netherlands 6,617; France 3,389; Italy 2,500.
Graphite, natural	33	19	(2)	China 7; Lebanon 6; Netherlands 2.
Gypsum and plaster	30,834	59,140	11,070	France 18,000; Greece 12,000; Cyprus 5,706.
Lime	13,333	30,658	910	Greece 12,990; Turkey 4,705; Lebanon 2,772.
Magnesite	137	164	--	Austria 100; Jordan 50; West Germany 14.
Mica:				
Crude including splittings and waste	908	1,584	360	India 1,193.
Worked including agglomerated splittings	90	203	(2)	United Kingdom 71; West Germany 26.
Nitrates, crude	2,058	5,923	23	Italy 5,000; West Germany 818; United Kingdom 36.
Phosphates, crude	19	314	--	Netherlands 116.
Pigments, mineral:				
Natural, crude	4,021	2,756	198	West Germany 945; United Kingdom 425; France 260.
Iron oxides and hydroxides, processed	9,576	56,530	5	India 46,107; Qatar 9,501; West Germany 558.
Potassium salts, crude	1,292	1	--	All from Belgium-Luxembourg.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$2,541	$571	--	West Germany $208; India $128; Thailand $46.
Synthetic do	$1,488	$1,121	$1	India $699; West Germany $228.
Pyrite, unroasted	21,123	97	1	France 69; United Kingdom 11; Belgium-Luxembourg 8.
Salt and brine	14,639	18,049	9,850	Netherlands 3,108; China 1,362; Taiwan 700.
Sodium compounds, n.e.s.:				
Carbonate, natural and manufactured	[r]34,664	42,460	2,639	Belgium-Luxembourg 9,397; West Germany 8,246; Jordan 7,932.
Sulfate, natural and manufactured	[r]770	3,074	45	Spain 1,308; West Germany 792; Canada 529.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	[r]76,673	46,315	744	Italy 36,747; Lebanon 1,530; Sweden 1,316.
Worked	502,388	492,177	6,177	Italy 352,958; Greece 41,625; Spain 28,582.
Dolomite, chiefly refractory-grade	1,786	2,512	16	France 1,123; Sweden 500; Norway 405.
Gravel and crushed rock	200,028	336,972	1,506	United Arab Emirates 269,514; Italy 51,907; Iran 2,064.
Limestone other than dimension	46,127	31,789	56	Greece 31,409; United Kingdom 143; Finland 130.
Quartz and quartzite	1,378	1,060	16	Italy 836; United Kingdom 20.
Sand other than metal-bearing	6,954	6,787	2,695	West Germany 960; Netherlands 893; United Arab Emirates 778.
Sulfur:				
Elemental:				
Crude including native and byproduct	92	900	10	Kuwait 732; West Germany 76.
Colloidal, precipitated, sublimed	1,209	819	9	France 337; Italy 104; Kuwait 100.
Dioxide	--	50	24	Japan 6.
Sulfuric acid	2,946	2,424	53	Netherlands 907; Belgium-Luxembourg 420; Bulgaria 210.
Talc, steatite, soapstone, pyrophyllite	954	927	--	Finland 235; India 198; Netherlands 160.
Other:				
Crude	2,234	6,025	1,722	West Germany 1,823; United Kingdom 621; India 570.
Slag and dross, not metal-bearing	258	541	--	West Germany 540.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,195	3,606	1,799	West Germany 634; Netherlands 330; France 227.

See footnotes at end of table.

Table 3.—Saudi Arabia: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Carbon: Carbon black	168	103	26	Netherlands 30; West Germany 13.
Coal: All grades including briquets	2,127	1,543	551	West Germany 502; Spain 187.
Coke and semicoke	116	457	312	Japan 96.
Peat including briquets and litter	449	929	NA	Canada 694; West Germany 188.
Petroleum:				
Crude 42-gallon barrels	5,300	5,774	2,381	West Germany 968; Belgium-Luxembourg 942; Netherlands 593.
Refinery products:				
Liquefied petroleum gas do	1,499	3,851	151	United Kingdom 893; France 882; West Germany 845.
Gasoline do	[r]918	5,151	791	Italy 3,732; United Kingdom 459.
Mineral jelly and wax do	1,845	1,763	142	West Germany 307; France 260; Japan 205.
Kerosine and jet fuel do	9,283	9,742	2,317	West Germany 2,829; Belgium-Luxembourg 1,604; Italy 984.
Distillate fuel oil do	17,019	5,095	828	Belgium-Luxembourg 2,507; Canada 634; Switzerland 313.
Lubricants do	1	1	(2)	NA.
Nonlubricating oils do	173	116	28	United Arab Emirates 52; United Kingdom 6; Italy 5.
Residual fuel oil do	1	3	(2)	Italy 1; Netherlands 1.
Bitumen and other residues do	[r]21	12	(2)	France 4; West Germany 2; United Arab Emirates 2.
Bituminous mixtures do	[r]50	41	16	United Kingdom 10; France 5; Spain 2.

[r] Revised. NA Not available.
[1] Table prepared by Virginia A. Woodson.
[2] Less than 1/2 unit.
[3] May contain vanadium and tantalum ores.
[4] May include platinum-group metals.

COMMODITY REVIEW

METALS

After 50 years of modern mineral exploration, which contended with large and sometimes inhospitable terrain, no major nonfuel mineral deposits were found and thus did not impact on Saudi development.

Commercial gold mining was to commence about 1985 at the ancient Mahd adh Dhahab Mine, with production of varying amounts of copper, silver, and zinc also expected. Another mine, Al-Masane, in far southern Saudi Arabia, had potential for copper, gold, silver, and zinc recovery. Commercial exploitation at various sites in the country was possible for iron ore, nickel, tungsten, bauxite, and phosphate. Undersea exploration in 1983 showed commercial possibilities for cadmium, copper, gold, lead, silver, and zinc.

Following an agreement signed in 1982 to jointly develop the minerals cadmium, cobalt, copper, gold, lead, and zinc that were found on the Red Sea floor during exploration and preliminary sea mining tests, a Saudi-Sudanese Red Sea Joint Commission was formed in 1983. The commission, headquartered in Jidda, Saudi Arabia, intended to conduct a 1-year test during 1985 to determine the feasibility of commercially mining these minerals. In 1983, a proposal for a pilot plant to investigate ways to mine, beneficiate, and process the metalliferous ores was under study, but owing to budgetary constraints, there was little likelihood that a plant would be started in under 2 years. Meanwhile, the commission's efforts were focused on determining the environmental impact of the new mining process.

Copper.—At the Al-Masane mining project in southern Saudi Arabia, the Arabian Shield Development Co. and Saudi Arabia's General Petroleum and Mineral Organization (Petromin) were arranging financing for a 1,500-ton-per-day milling complex to be ready by the end of 1983 to permit mining the copper, zinc, gold, and silver ores in the deposit. A feasibility study concluded that the massive sulfide deposits contained 4.5 million tons of ore grading 1.6% copper, 4.8% zinc, 1.8 grams of silver per ton, and 35 grams of gold per ton.

These reserves were considered sufficient to support a 1,500-ton-per-day underground mining operation for 9 years with reasonable expectations of finding additional reserves within the immediate area that might extend the mine's life to 15 years. Exploratory drilling was continuing in 1983 along the Moyeath ore zone discovered in 1982. Tests of the drill cores indicated another 3 million tons of ore containing all the above metals, but with zinc being about three times richer.

Gold.—Production of gold from the centuries-old Mahd adh Dhahab gold deposit moved closer to realization. Under the sole ownership of Petromin, development of a 400-ton-per-day mine about 170 miles northeast of Jidda was begun. Detailed design work was undertaken for Petromin by Gold Fields Mahd adh Dhahab Ltd. During the first half of 1983, considerable site preparation was undertaken for the inauguration ceremonies on April 30, which was viewed as a firm commitment by the Government to reestablish gold mining at this historic site. In addition to enlarging the mine's airstrip, an ore separation plant was to be constructed. Mine production, at 400 tons per day, was planned for 1986. Life of the mine was anticipated to be 10 years during which production was estimated at 30 tons of gold, 90 tons of silver, 8,000 tons of copper, and 27,000 tons of zinc. For the project to be economically viable, world gold prices must remain at least at $350 to $400, supported by silver at least at $11 per ounce.

Similar promising finds of copper, gold, silver, and zinc in 1983 were at Al-Masane in southwestern Saudi Arabia. Many other mineral localities were being studied; most were promising but small and not economically viable unless multimine development was possible.

Iron and Steel.—Arabian Shield Development continued its interest in the nickel-iron deposit at Wadi Qatan in southwestern Saudi Arabia. A preliminary study was started during 1983 by Klöckner Werke AG, of the Federal Republic of Germany, on the feasibility of opening a 2,000-ton-per-day mine with a normal yield of enough ore for 200,000 tons of sponge iron, 32,000 tons of ferronickel, and a small amount of cobalt. The study also was to evaluate the possibility of a 200,000-ton-per-year steel mill to serve southern Saudi Arabia and Yemen (Sanaa). If results of the investigation were positive, Arabian Shield intended to conduct a more detailed feasibility study involving an 18-month drilling program to outline the ore body. Arabian Shield Co., a U.S. registered company, was owned 65% by Saudi interests and held exploration licenses from the Saudi Deputy Ministry for Mineral Resources in Jidda.

Construction of the large-scale pilot plant, which would concentrate low-grade Wadi Sawawin iron ore to 65% iron content continued at Al Muhwaylih. The plant's startup, which was delayed in 1983, was expected in 1984. Located on the Red Sea coast about 60 kilometers west of Wadi Sawawin, the plant was to fine grind the ore and then, using a flotation process devised by the U.S. Bureau of Mines Research Center at Minneapolis, Minnesota, increase the iron content to 63% to 65% in pellets. Between 145 and 150 technicians and other workers were engaged in conducting the tests. Mining, drilling, and bulk sampling had, by 1983, identified proven reserves of 350 million tons of 42% iron taconite ore that could be open pit mined.[3] The gravel road between the mine and the coast was improved during the year in anticipation of considerable heavy truck traffic. Preparation for mining of Wadi Sawawin was also going forward, but actual quarrying was delayed pending the grant of a license to purchase explosives. If the Wadi Sawawin project, into which the kingdom had invested $100 million, proves to be viable, a beneficiating plant capable of producing about 2 million tons per year of 65% iron pellets will be built nearby. The pellets would be shipped to the newly completed steelworks at Jubail. Pilot plant testing of seven different multiton samples of ore was to continue until September 1985.

Saudi Arabia entered the ranks of the world's steel producers during the first quarter of 1983 with the opening of the integrated steelworks of the Saudi Iron and Steel Co. (Hadeed) at the industrial city of Jubail on the Persian Gulf. The works' annual capacity was 850,000 tons of raw steel and 800,000 tons of finished steel. During the first year's operation, a total of 275,000 tons of reinforcing bar and wire rod was made. Estimates of Saudi Arabian demand for rebar ranged from 2 to 2.5 billion tons per year, mostly imported from Japan.

The Hadeed complex consisted of three computerized production plants: (1) a direct-reduction plant consisting of two Midrex units to produce sponge iron; (2) a steelmaking plant consisting of three 125-ton electric arc furnaces; and (3) a two-unit rolling mill, of which one produced 530,000 tons per year of rebar while the second unit made 270,000 tons per year of wire rod. All energy came from natural gas. The Hadeed works required $1.2 million tons per year of iron ore, of which more than one-half would come from foreign sources even if the Wadi Sawawin and other iron ore sources were to prove viable. Additional annual local requirements were 100,000 tons of scrap, 50,000 tons of lime, 7 billion cubic feet of natural gas, and 1 billion kilowatt hours of electricity. At the outset, iron ore was imported mainly from Brazil with one Swedish company shipping hematite pellets to Hadeed. At yearend 1983, Hadeed employed 650 Saudis and 1,457 expatriate persons, down from a peak of 2,300. Hadeed was 86% owned by Saudi Arabian Basic Industries Corp. (SABIC) and the balance was owned by two West German firms.[4]

NONMETALS

Cement.—Cement production from seven operating plants was 8.1 million tons, about 14% more than that of 1982 but only 35% of demand. The balance was imported from Bulgaria, Japan, Portugal, Romania, Spain, and Yugoslavia. Producing capacity was 9.2 million tons, and another 4.8 million tons of new capacity was to come from three new plants under construction: the Saudi Kuwait Cement Manufacturing Co. plant at Ras al Khafji close to the Kuwait border adding 2.1 million tons of clinker and 900,000 tons of finished cement; expansion of the Arabian Cement Co.'s plant at Rabigh providing an additional 1.4 million tons; and the Saudi White Cement Co. plant at Riyadh adding 400,000 tons. Between increasing producing capacity and the leveling off of construction activity in Saudi Arabia, the need for imported cement should fall and imports should be at a much lower rate in the second half of the decade.

Salt.—In its development of a petrochemical industry, SABIC required large volumes of salt to make chlorine. Extensive salt deposits were delineated at Jizan near the border with Yemen (Sanaa), the Red Sea Basin, and southwest of Dharam.

Several desalinization plants were additional sources of salt. SABIC planned a 330,000-ton-per-year chlorine plant at Al Jubail, which was scheduled for completion in 1985. In 1983, Seltrust Engineering Ltd. of London was awarded a contract by the Deputy Ministry for Mineral Resources to do exploratory drilling of the Red Sea evaporites, including salt. Work began in October and was to go forward for at least 1 year.

Sulfur.—Construction of two new petroleum refinery sulfur facilities continued essentially on schedule in 1983. The Petromin-Shell Saudi Arabia Refining Ltd. plant at Al Jubail was on schedule with completion set for 1984. The three units in the refinery would furnish 150,000 tons of sulfur per year. The Petromin-Mobil Oil Corp. plant at Yanbu, which was to be completed in 1984, would be capable of producing about 300 tons of sulfur per day from refinery gas. The Arabian-American Oil Co. (Aramco) contracted for a sulfur recovery unit to be added to its Ras Tanura refinery for operation by 1986, at a cost of an estimated $8.5 million.

MINERAL FUELS

Coal.—Early in 1983, the Coal Ministry announced the discovery of coal underlying a 450-square-kilometer area around Mujamma in the northern part of Saudi Arabia. The deposit was described as substantial, with beds of coal ranging from 10 to 15 meters thick, extending a distance of 30 kilometers at widths ranging from 60 to 70 meters. The deposit's potential remained to be fully evaluated at yearend.

Natural Gas.—Proven recoverable reserves of natural gas rose slightly from 117 trillion to 118 trillion cubic feet. In the period 1980 through 1983, even in the face of tremendous gas withdrawals, gas reserves increased about 10%. Although much Saudi gas was associated with crude oil, increasing amounts were to begin flowing from nonassociated reservoirs tapped to meet the kingdom's gas delivery commitments for desalinization plants, electrical generation, and a growing number of petrochemical facilities.

By 1983, Saudi Arabia, already a key member of OPEC, had become the so-called swing member of OPEC because it could best adjust its crude oil production to rectify imbalances created by the output of some of the other OPEC members. As the kingdom's sales of crude oil were reduced to keep OPEC allocations in balance, associated gas produced with the oil was insufficient to satisfy all gas sales contracts, which included about 45 separate customers planning to buy liquefied petroleum gas. All contracts were adversely affected by the cutbacks.

During the hottest summer months, insufficient associated gas was produced to fuel the Eastern Province's electric power generation plants and about 30 desalinization plants with combined output of 557 million gallons of fresh water daily. Such shortfall eventually caused a total shutdown of the electrical supply network. To get enough gas from its oil wells, the Government increased oil production, which was stored in huge tankers that were sent out of the Persian Gulf. An emergency oil marketing company, Norbec of Switzerland, was created to handle spot sales, mostly to major oil buyers in Europe, Japan, and the United States. Prices were at official Government prices but on spot market terms. Companies bought on a cargo-by-cargo basis with no other commitment on either side.

Gas shortages were causing concern among foreign companies having heavy investments in petrochemical operations at Jubail and Yanbu. Saudi Arabia was underlain by the deep Khuff Zone, into which drilling was beginning. Production in needed quantities would be unavailable until sometime in 1984. The kingdom also considered temporarily importing gas from neighboring Persian Gulf countries via a pipeline that would have to be laid from nearby Qatar and the United Arab Emirates.

Petroleum.—*Exploration.*—The combination of active onshore and offshore drilling programs, together with sharply reduced production of crude throughout the year, resulted in an increase in 1983 crude oil reserves to 166 billion barrels, up from 162.4 billion barrels in 1982.

In January 1983, Aramco began a major land survey in the Eastern Province, extending south from Khafji along the gulf coast (including the offshore areas), west to Khurais, and north to the Hafar al Batin region bordering Iraq. The purpose of the survey was to establish geodetic control; mark concession boundaries; make topographic maps; perform engineering studies for planning, design, and construction; and prepare charts of the offshore area. The 164,000-square-kilometer area contained many crude oil and natural gas reservoirs. By early 1983, Aramco operated a total of 46 drilling rigs in the kingdom, both onshore and offshore. Twenty-five of these rigs were used for exploration and development drilling while 21 were engaged in well workovers.

Production.—Saudi Arabia's crude oil production continued to decline sharply. The decline started in late 1981 when the kingdom began curtailing production in an attempt to prop up sagging oil prices. In the early months of 1983, the level of production was down sharply from an average of 9.8 million barrels per day in 1981 and 6.5 million barrels per day in 1982. By March 1983, production was, for a few days, only 3.5 million barrels per day. For the first quarter, production averaged 4.1 million barrels per day; in the second quarter, it averaged 4.6 million barrels per day; by the third quarter, production had increased to 5.8 million barrels per day to ensure adequate supplies of associated gas for the master gas system; and in the final quarter, production leveled off at 5.5 million barrels per day. The leveling-off was due to the 30-day closure of the Marjan and Zaluf offshore fields beginning in mid-December in order to connect the two fields' associated gas production with the new Safaniyah gas gathering complex. Average production for the full year was 5 million barrels per day, a drop of 23% from the daily production averaged in 1982. The kingdom's oil revenues were $37.1 billion compared with $70.5 billion in 1982.

Aramco produced 98% of Saudi Arabia's oil, a total of 1.75 billion barrels of oil in 1983, or 4.8 million barrels per day. The Getty Oil Co. and Arabian Oil Co. produced 54,794 and 147,950 barrels per day, respectively.

During 1983, Aramco drilled 160 development wells, both onshore and offshore. Exploratory wells totaled 25. At yearend, six additional wells were drilled, tested, or waiting on testing equipment.

Early in 1983, Aramco, through Aramco Overseas Co., contracted for facility expansion in three huge reservoirs in the Persian Gulf off Saudi Arabia. Halcrow-Ewbank Petroleum & Offshore Engineering Co. of London was to provide engineering, project management, and construction management services. In the Safaniya Field, Halcrow-Ewbank was to perform conceptual design, project engineering management, fabrication, and construction management for a major new platform, which was to support oil and gas processing and well-test facilities. Also, a new living quarters module and support utilities were to be provided. Submarine power cables were to be laid to the new complex as well as to satellite tie-in and production platforms. In the nearby Marjan and Zuluf Fields, the contractor was to provide detailed engineering, fabrication, and construction management;

material procurement assistance; and inspection for two accommodation platforms under construction.

Refining.—Three operating refineries, with combined daily throughput capacity of 705,000 barrels, served Saudi Arabia's domestic market as 1983 began. Aramco's giant Ras Tanura refinery was the oldest and the largest with a capacity of 470,000 barrels per day of crude oil plus 190,000 barrels per day of natural gas liquids. Petromin's Riyadh Oil Refinery Co. at Riyadh had a capacity of 130,000 barrels per day; another Petromin subsidiary, the Jidda Oil Refinery Co. at Jidda, only had a capacity of 105,000 barrels per day. In July, a fourth domestic refinery with a capacity to handle 155,000 to 170,000 barrels per day was put into operation on the Red Sea coast of Saudi Arabia at Yanbu. Wholly owned by Petromin, the refinery received its crude from eastern Saudi Arabia via the Abqaiq-Yanbu Pipeline (Petroline). This added refined product capacity obviated custom refining in Greece and Italy. Petromin did not renew contracts with foreign refiners expiring in April 1983 for 130,000 barrels per day.

Construction of the 150,000-barrel-per-day Buraydah domestic refinery, located in the Central Province, was expected to begin during 1984. Saudi Arabian Bechtel Co. completed a feasibility study for the project late in 1983, and a number of companies and consortia were lined up to work on the project. Construction was to be supervised by Aramco on behalf of Petromin.

Construction of a second 150,000-barrel-per-day domestic refinery at Shuqaiq (also called Gahama), about 100 kilometers north of Jizan on the Red Sea coast in southwestern Saudi Arabia, was deferred indefinitely.

Three joint-venture export refineries, with a total capacity of 825,000 barrels per day, were in advanced stages of construction. The refined product output of these refineries, owned by Petromin in partnerships with foreign oil companies, was to be exported. Work on the Petromin-Shell Saudi Arabia Refining 250,000-barrel-per-day refinery at Jubayl was begun in February 1981 and was more than one-half completed by 1983. Cost was expected to be $1.4 billion with a 1985 completion. One of the major construction partners, Parsons International Ltd., claimed the refinery's centralized management and control instrumentation system to be the most advanced ever designed, equal to 10 control rooms and more than 100 meters of manually controlled panels. The Petromin-Mobil export refinery at Yanbu was begun in 1982 with completion planned for yearend 1984. Throughput capacity was to be 250,000 barrels per day. The third new export refinery, by Petromin and Petrola International of Greece, was to be located at Rabigh, was the largest of the three with throughput capacity of 325,000 barrels per day, was to cost $3 billion, and was scheduled to commence operation in 1986.

A number of lubricating oil refineries, designed to satisfy domestic demand, were in various stages of development during 1983. Petromin's subsidiary company, Petrolube, was a partner with primarily U.S. oil companies in these ventures. At Jidda, Petrolube and Mobil were completing work to double the lube plant's output to 5,000 barrels per day at a cost of $9 million. The combine's updated plant at Riyadh was also nearing completion and also was to double output to 2,740 barrels per day at a cost of $7 million.

Across the Arabian Peninsula at the new industrial city of Yanbu, a lube-oil base-stock plant was in advanced stages of planning and design. Petrolube and Ashland Oil Inc. of the United States announced in the summer of 1983 that negotiations to proceed with the work were almost complete.

Meanwhile, plans for a $1 million, 12,000-barrel-per-day blending plant at Jubail, to be built by Petrolube with Chevron Research and Texaco Inc., appeared to be shelved for the present.

Petrochemicals.—Early in 1983, and within a month of the decision by The Dow Chemical Co. of the United States to withdraw from a joint venture with SABIC to build a 500,000-ton-per-year, $727 million ethylene complex at Jubail, a contract was signed between SABIC and a joint Saudi-Japanese venture, identified as Chiyoda-Petrostar, for design, engineering, and construction of an ethylene plant. The plant will be operated by the Arabian Petrochemical Co. (Petrokemya), a 100% owned subsidiary of SABIC. Chiyoda-Petrostar was part of the Chiyoda Chemical Engineering & Construction Co. Ltd. of Japan. Previous plans for a 180,000-ton-per-year high- and low-density polyethylene unit were dropped. By midyear, Petrokemya also awarded Union Carbide Corp. a management services and training agreement for assistance in design, construction, startup, and initial operation of the new plant. The plant was scheduled for completion in 1985.

In 1983, SABIC was involved in 11 projects in various stages of construction. Of the four projects at Jubail, three were petrochemical, including Petrokemya, while the fourth was a $100 million oxygen and nitrogen plant.

Meanwhile, across Saudi Arabia to the west, the kingdom's huge grassroots petrochemical complex at Yanbu was nearing completion. The $2.4 billion ethylene complex, scheduled for startup early in 1985, was within budget and on schedule. The plant was being built for Mobil Saudi Yanbu Petrochemical Co., a joint venture of Mobil Yanbu Petrochemical Inc. and SABIC. The builder, Bechtel Petroleum Inc.'s Houston Div., credited modular design with keeping the plant's construction on schedule. The plant was the largest modularization job Bechtel had ever undertaken. One hundred and twenty-one separate modules were involved.

The Yanbu petrochemical complex will have a capacity of 455,000 tons per year of ethylene, 200,000 tons per year of monoethylene glycol, 91,000 tons per year of high-density polyethylene, and 205,000 tons per year of low-density polyethylene. It will use the ethane feed from the Yanbu gas-processing facilities operated by Aramco.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Saudi riyals (SRls) to U.S. dollars at the rate of SRls3.45=US$1.00.

[3] Deputy Ministry for Mineral Resources, Kingdom of Saudi Arabia. Saudi Arabia Mineral Resources Report—1402-03 (AD 1983). Jidda, Saudi Arabia, pp. 23-24.

[4] U.S. Embassy, Riyadh, Saudi Arabia. State Dep. Telegram 03541, July 1984, pp. 1-2.

The Mineral Industry of Sierra Leone

By Ben A. Kornhauser[1]

Sierra Leone's economy was affected seriously by the greatly reduced income from the export of diamonds, which normally accounted for more than one-half of its export earnings. In other areas of the mineral industry, which was the main earner of foreign exchange, iron ore and rutile exports were increased greatly. The rehabilitated Marampa Iron Ore Mining Co. Ltd. made its first iron ore shipment in February.

To strengthen its economy, Sierra Leone developed a more stringent fiscal year 1983 budget and instituted, with the help of the International Monetary Fund, a system of two-tier exchange rates. The lower "official market" rate was used to purchase essential commodities, imports associated with loans and grants, payments of official debts, and previously approved foreign exchange transactions. Other foreign exchange items required a higher commercial market rate based on biweekly foreign exchange allocations from the Bank of Sierra Leone. Economic recovery and the viability of Sierra Leone's economy in the near term depended on continued financial assistance from the International Development Agency of the International Bank for Reconstruction and Development, the European Economic Community, the African Development Bank, the Islamic Bank, and directly from Western countries.

PRODUCTION AND TRADE

In 1983, the production of iron ore, rutile, and diamond increased approximately 536%, 50%, and 27%, respectively, while bauxite production decreased 17%. The huge increase in iron ore production resulted from the resumption of mining in the Marampa Range. Rutile concentrate shipments of 69,475 tons were up from the previous 1982 record. In 1982, the value of all exports to the United States was estimated at $17 million[2] while all imports from the United States were only $12 million. The major export markets were the United Kingdom, the United States, and the Federal Republic of Germany. Its major import suppliers were the United Kingdom, France, the United States, Nigeria, and Japan.

The scarcity of foreign exchange continued to be a problem for Sierra Leone and was a major reason for the lack of industrial development. Mineral exports were the principal earners of foreign exchange. Diamonds consistently accounted for more than one-half of the export earnings. Accordingly, the decline in recorded diamond production, coupled with low prices, had a debilitating effect on the economy and trade, causing a decline in real gross domestic product.

The new investment code became operative following the enactment of the Development of Industries Bill, 1983, by Parliament. The act was designed to encourage the development of industries by creating certain incentives and guarantees to attract local, expatriate, and foreign investments, and to guide and regulate their activities. Among the incentives were the following:

1. Preferential treatment in granting and processing of import licenses.
2. Partial or total exemption from cus-

toms duty on capital equipment, raw materials, and intermediate goods for approved projects that would not otherwise be viable financially.

3. Relief from surtax for a period not exceeding 5 years, as the Project Approval Committee may determine, with the provision that the relief shall not exceed the original invested capital by 150% per year.

4. Relief from income tax in a manner, and for a period not exceeding 5 years, as the Project Approval Committee may determine.[3]

Table 1.—Sierra Leone: Production of mineral commodities[1]

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
Aluminum: Bauxite, gross weight thousand metric tons	672	766	610	606	506
Diamond:					
Gem thousand carats	419	317	208	203	258
Industrial do	436	275	97	87	111
Total do	855	592	305	290	369
Gold troy ounces	NA	407	3,435	8,729	9,000
Iron ore metric tons	--	--	--	66,000	419,500
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	421	375	343	228	NA
Jet fuel do	277	306	131	84	NA
Kerosine do	105	99	213	151	NA
Distillate fuel oil do	586	533	548	414	NA
Residual fuel oil do	434	420	383	295	NA
Liquefied petroleum gas do	7	7	9	9	NA
Other do	2	2	NA	1	NA
Refinery fuel and losses do	55	173	88	25	NA
Total do	1,887	1,915	1,715	1,207	NA
Salt[e] thousand metric tons	200	200	200	200	200
Titanium: Rutile ore and concentrate, 96% TiO_2 gross weight metric tons	10,000	47,497	50,795	47,709	71,800

[e] Estimated. [p] Preliminary. NA Not available.

[1] Table includes data available through June 30, 1984.

[2] In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone) is produced, but output is not reported, and available general information is inadequate to make reliable estimates of output levels. Sierra Leone annually refines 4,000 to 10,000 metric tons of salt from imported crude marine salt, but this is not included in the body of the table because it would represent double counting of materials credited to the country where the salt was originally collected. This output would be in addition to that reported in this table.

COMMODITY REVIEW

METALS

Iron Ore.—The rehabilitated Government-owned Marampa iron ore mines made its first shipment of 70,000 tons of iron ore, valued at $800,000 to Austria in February 1983. The mines had been reactivated and operated by Austromineral GmbH, a subsidiary of the Austrian state-owned firm of Voest-Alpine AG. The ore was transported 48 miles by Government-owned rail to a shiploading facility at Pepel. The trains consisted of 40 bottom-discharge cars, each of 40-ton capacity, and hauled by a 2,000-horsepower, diesel-electric locomotive. The ore stockpile at Pepel could hold 120,000 tons. The dredged channel allowed vessels up to 100,000 deadweight tonnage to be berthed in the harbor.

Titanium.—The Sierra Rutile Ltd. (SRL), wholly owned by Nord Resources Corp. of Ohio, produced a record tonnage of rutile concentrate (96% TiO_2) for the country but only shipped 69,475 tons. Nord was able to gain 100% ownership of SRL through favorable agreements with the Bethlehem Steel Corp. and the Export-Import Bank (Eximbank). Except for $5.25 million of the approximate $30 million debt to Bethlehem and Eximbank, the loan was noninterest bearing. The interest-bearing portion was only at a 7.5% rate. Bethlehem decided to sell its equity in SRL owing to the recession of 1982 and other economic factors. The Government of Sierra Leone has an option through November 1986 to acquire 47% of SRL.

Because, in Sierra Leone, the rutile and mineral beach sands were associated with a thick red lateritic mud, a bucketline dredge was employed in mining the deposit in conjunction with a wet concentration and dry separation plant.

NONMETALS

The Mining and Investment Co. International (S.L.) Ltd., a private mining company, had two mining sites for gold and diamond deposits. The company was financed by the Burkman family of California. The gold would be mined in the Bo District and the diamonds at Ghahama.

In July 1983, an agreement was signed between the National Diamond Mining Co. (100% Government-owned), which will own 60%, and BP Minerals International Ltd., which will own 40%, concerning a $140 million kimberlite project for the underground mining of diamonds.[4]

MINERAL FUELS

The Richolson Oil and Gas Co. was authorized to search for oil on the island of Sherbro. The Trans Sierra Oil Co. was to start drilling in the northern interior of the country.[5]

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Leones (Le) to U.S. dollars at the rate of Le1 = US$0.40.

[3] West Africa (London). No. 3455, Oct. 31, 1983, p. 2524.

[4] WE YONE (Freetown). July 24, 1983, p. 2.

[5] Industries et Travaux D'Outre-Mer. No. 350, Jan. 1983, p. 39.

The Mineral Industry of the Republic of South Africa

By Miller W. Ellis[1]

The mineral industry of the Republic of South Africa continued to provide the basis of the country's widely diversified economy, to produce a number of mineral commodities vital to the world's major industrial countries, and to realize approximately 50% of South Africa's foreign exchange from mineral exports. The gross domestic product of \$79 billion[2] was 8% greater than that for 1982.[3] This was equivalent to a 12% increase in terms of local currency, which had depreciated in terms of the U.S. dollar during the year. Devaluation of the rand again tended to neutralize the effects of the world's generally depressed mineral prices on the local economy. The total value of domestic and export sales of raw mineral products, including cement, was \$14.9 billion, an increase of 8% over sales for 1982. This was substantially augmented by sales of mineral-related manufactures such as coke, refined and fabricated metal products, fertilizer materials, and cut gem stones.

Most of the mineral-related activity was managed by the six major multinational mining corporations responsible for the development of much of the mineral industries in the southern part of the continent: Anglovaal Ltd. (AVL), Anglo American Corp. of South Africa Ltd. (AAC) with its subsidiary De Beers Consolidated Mines Ltd., Barlow Rand Ltd. (BRL), General Mining Union Corp. Ltd. (Gencor), Gold Fields of South Africa Ltd. (GFSA), and Johannesburg Consolidated Investment Co. Ltd. (JCI). Certain aspects of the mineral industry were participated in or controlled by Government companies such as the South African Iron and Steel Industrial Corp. Ltd. (Iscor), which operated mines and quarries for raw material for its three iron and steel plants. The Industrial Development Corp. of South Africa Ltd. (IDC) participated directly in the production of fertilizers and other commodities needed for the development of the country, and the South African Coal, Oil and Gas Corp. Ltd. (Sasol) continued to increase public participation in its oil-from-coal operations by sale of shares. The State Alluvial Diamond Diggings of Alexander Bay near the mouth of the Orange River in northwestern Cape Province was managed by the Department of Mineral and Energy Affairs.

Approximately 350 U.S. companies or their affiliates had direct investments totaling \$2.5 billion in the Republic of South Africa at the beginning of 1983, and many appeared to be interested in expanding that position by retention of local earnings and by the infusion of new capital. Most of these companies had a record of voluntary adherence to principles of improved treatment and training, and an enhanced quality of life for employees of all races. Following the official recognition of black workers as members of nonwhite trade unions in 1982, their membership increased to an estimated 500,000 workers, and black unions were officially recognized by mid-1983. In the mineral industries, with a total of 750,000 workers, the number of strikes and work stoppages actually declined because differences were settled by conciliatory discussions and negotiations. Fewer than 65,000 workers participated in 336 strikes and stoppages involving the loss of fewer than 1 million worker hours, compared with more than 14,000 workers losing nearly 3 million worker hours in 394 strikes during 1982.

PRODUCTION AND TRADE

The Republic of South Africa maintained its position as the world's leading producer of gem diamonds, gold, platinum, and vanadium and was one of the world's top three producers of asbestos, chromite, manganese ore, uranium, and vermiculite. Production of gold increased slightly as did that of asbestos, chromite, phosphate rock, and uranium oxides. Copper production was up, largely because of a record high 138,738 tons of cathode from Palabora Mining Co. Ltd. (PMC), one of the world's lowest cost mines, with a profit of nearly $29 million for the year, or more than $0.09 per pound of refined metal. The working cost was $0.62 per pound. Production of bituminous coal increased nearly 5% above that of 1982, to a record 143.5 million tons; of which, more than 28 million tons was exported for another record of 10% more than that of 1982. Diamond output increased 12.6% to 10.3 million carats, and export sales were a record high 11.3 million carats valued at more than $472 million. Production of zinc in concentrate increased more than 20%, but less than 50% as much was exported as in 1982. On the negative side, manganese ore output plummeted 45%, and export sales value was 36% below that of 1982; hematitic iron ore production was down 35%, and the value of export sales dropped 25% below that of 1982.

Outputs of lead, tin, and vermiculite were 11%, 12%, and 16%, respectively, below those of 1982. The prolonged drought had a minimal effect on mineral production from the country's larger producers, but it did increase the need for imported maize and other foodstuff, and caused a major upsurge in trade. The United States regained its status as the top source of materials imported by the Republic of South Africa, followed closely by the Federal Republic of Germany, Japan, and the United Kingdom, each of which provided goods valued at about $2 billion during the year. Switzerland, Japan, and the United Kingdom ranked second, third, and fourth, after the United States as importers of South African goods. The $9.15 billion value of gold sales was an increase of 13% in dollar terms and 16% in terms of local currency and indicated an average value of $419 per troy ounce. The export values of silver and diamonds increased more than 50% each in terms of local currency, with an average value of $14 per troy ounce for the silver and $46.55 per carat of rough diamond. Apart from grain for stock feed, crude petroleum, nitrate fertilizer material, sulfur, and soda ash were the country's principal imports.

Table 1.—Republic of South Africa: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum metal	86,300	86,600	87,000	87,000	163,600
Antimony concentrate:					
Gross weight	20,086	22,372	16,599	15,314	10,670
Metal content	11,657	13,067	9,810	8,525	6,302
Beryl concentrate (11% to 12% BeO)	1	(2)	122	58	19
Chromite, gross weight:					
More than 48% Cr_2O_3 thousand tons	33	20	36	33	25
44% to 48% Cr_2O_3 do	1,633	1,989	1,561	1,193	1,070
Less than 44% Cr_2O_3 do	1,631	1,405	1,273	939	1,129
Total[3] do	3,297	3,414	2,870	2,164	2,232
Columbium-tantalum concentrate kilograms	765	1,912	3,615	9,960	406
Copper:					
Mine output, metal content	190,591	200,683	208,700	207,100	220,000
Metal:					
Smelter	178,000	180,819	199,424	194,000	204,984
Refined	150,757	140,887	144,100	142,800	138,738
Gold, primary thousand troy ounces	22,617	21,669	21,121	21,355	21,847
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	31,565	26,312	28,319	24,554	16,605
Iron content do	20,202	16,840	18,124	15,714	10,627
Metal:					
Pig iron do	7,031	7,515	7,365	6,762	5,213

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982^{p}	1983^{e}
METALS —Continued					
Iron and steel —Continued					
Metal —Continued					
Ferroalloys, blast furnace and electric furnace:^{e}					
Ferrochromium thousand tons	780	800	750	600	580
Ferromanganese do.	560	520	450	440	350
Ferrosilicochrome do.	28	38	20	20	18
Ferrosilicomanganese do.	45	70	50	40	30
Ferrosilicon do.	149	162	110	100	100
Ferrovanadium do.	(2)	(2)	(2)	(2)	(2)
Silicon metal do.	35	30	30	30	22
Total do.	^{r}1,597	^{r}1,620	^{r}1,410	^{r}1,230	1,100
Steel, crude do.	8,868	9,068	9,004	8,271	7,004
Semimanufactures:					
For immediate sale do.	200	207	93	NA	NA
Hot-rolled products do.	6,395	6,568	6,707	NA	NA
Iron castings do.	1,928	2,236	2,092	NA	NA
Steel castings and forgings do.	139	72	76	NA	NA
Total do.	8,662	9,083	8,968	NA	NA
Lead:					
Mine output, metal content	--	86,059	98,901	90,288	80,200
Smelter	23,300	35,400	26,900	30,400	29,600
Manganese ore and concentrate, gross weight:					
Metallurgical:					
Over 48% Mn thousand tons	296	290	368	442	674
45% to 48% Mn do.	998	942	1,226	1,423	268
40% to 45% Mn do.	763	997	676	713	415
30% to 40% Mn do.	2,897	3,099	2,429	2,301	1,270
Total do.	4,954	5,328	4,699	4,879	2,627
Chemical:					
Over 65% MnO_2 do.	(2)	(2)	(2)	(2)	(2)
35% to 65% MnO_2 do.	153	166	45	39	98
Less than 35% MnO_2 do.	76	201	296	295	161
Total do.	229	367	341	334	259
Total[3] manganese do.	5,183	5,695	5,040	5,217	2,886
Manganiferous iron ore (15% to 30% Mn, 20% to 35% Fe)	--	--	--	NA	NA
Nickel:					
Mine output, metal content	30,290	25,700	26,400	^{e}20,600	20,500
Metal, electrolytic	8,040	18,100	17,960	14,425	17,000
Platinum-group metals, metal content of concentrate, matte, refinery products^{e} [4] thousand troy ounces	3,017	3,100	3,110	2,600	2,600
Silver:					
Mine output, metal content^{e} do.	3,240	7,144	7,568	6,943	5,559
Primary do.	3,236	3,125	3,050	3,080	2,700
Tin:					
Concentrate:					
Gross weight	5,706	^{e}6,160	^{e}6,950	^{e}7,500	6,700
Metal content	2,697	2,913	2,811	3,035	2,668
Metal, primary[5]	819	1,100	2,602	2,884	2,685
Titanium:					
Rutile concentrate^{e}	41,740	48,000	49,900	47,000	50,000
Slag	286,700	344,000	370,000	381,000	400,000
Uranium oxide (U_3O_8)	5,637	7,295	7,235	6,833	7,128
Vanadium:					
Vanadiferous slag, gross weight	55,000	^{e}60,000	^{e}62,000	^{e}62,000	35,825
V content:					
Of vanadiferous slag^{e}	8,400	8,620	8,980	8,540	4,500
Of V_2O_3 and vanadate products^{e}	3,900	4,080	3,820	3,460	2,000
Total	^{e}12,300	12,700	12,800	12,000	6,500
Zinc:					
Concentrate:					
Gross weight	107,646	158,137	174,377	^{e}183,000	200,000
Metal content	53,823	79,068	87,172	91,516	109,981
Metal, smelter	75,400	81,400	87,200	79,700	83,300
Zirconium concentrate (baddeleyite and zircon)^{e}	82,000	80,000	100,000	125,000	--

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
NONMETALS					
Asbestos:					
Amosite	39,058	51,646	56,834	43,457	40,656
Anthophylite	--	--	--	--	93,016
Chrysotile	91,828	106,940	76,772	81,140	87,439
Crocidolite	118,301	118,148	102,337	87,263	--
Total	249,187	276,734	235,943	211,860	221,111
Barite	2,494	2,635	2,247	3,177	6,683
Cement, hydraulic thousand tons	6,900	[r]7,200	8,095	8,010	7,897
Clays:					
Attapulgite	4,062	3,684	5,221	4,398	4,425
Bentonite	46,394	49,815	44,372	30,827	39,529
Fire clay	310,670	154,967	282,645	259,767	117,807
Flint clay	180,070	190,488	171,500	163,075	69,984
Fuller's earth	919	720	434	311	312
Kaolin	148,740	107,500	155,003	127,891	129,605
Montmorillonite	1,267	1,115	354	--	--
Corundum, natural	74	141	91	62	49
Diamond:					
Gem[e] thousand carats	3,539	3,403	3,429	3,342	3,760
Industrial[e] do.	4,845	5,117	6,097	5,812	6,551
Total do.	8,384	8,520	9,526	9,154	10,311
Diatomite	1,059	584	615	596	1,088
Feldspar	47,416	52,247	57,052	47,854	44,817
Fluorspar:					
Acid-grade	387,305	[e]448,783	451,614	293,821	232,750
Ceramic-grade	8,477	[e]9,823	6,118	9,628	6,406
Metallurgical-grade	55,330	[e]64,112	38,789	27,386	28,446
Total	451,112	522,718	496,521	330,835	267,602
Gem stones, semiprecious:					
Emerald crystals kilograms	1,781	432	502	[e]547	575
Tiger's-eye do.	212,947	163,157	220,034	[e]112,000	120,000
Graphite	394	--	--		
Gypsum, crude	377,467	452,490	554,827	534,991	518,353
Kyanite-related materials:					
Andalusite	134,177	196,516	181,272	155,723	116,576
Sillimanite	19,574	16,194	15,504	10,060	815
Lime[5] thousand tons	1,721	2,184	2,251	2,150	1,892
Magnesite, crude	65,336	59,975	56,557	31,927	22,560
Mica:					
Sheet kilograms	64	252	--	NA	NA
Waste	3,617	5,046	2,395	1,762	2,672
Nitrogen: N content of ammonia thousand tons	563	549	552	571	575
Phosphate rock, gross weight do.	3,221	3,185	2,617	2,815	2,887
Pigments, mineral, natural:					
Ochers	1,244	710	742	1,812	1,319
Oxides	917	660	555	324	369
Total	2,161	1,370	1,297	2,136	1,688
Pyrites, gross weight	910,723	1,450,000	1,475,000	[e]1,500,000	1,500,000
Quartz, quartzite, glass sand (silica) thousand tons	1,376	1,629	1,387	1,260	1,135
Salt	538,735	567,270	539,801	586,210	726,841
Silcrete	5,783	5,430	9,243	5,582	1,839
Stone, n.e.s.:					
Dimension:					
Granite:[5]					
Sawn slabs	20,471	28,910	23,535	12,595	11,000
Rough blocks	193,563	181,250	182,770	160,000	150,000
Marble	7,562	5,965	6,327	6,725	4,936
Crushed and broken:					
Limestone thousand tons	17,406	19,869	21,107	22,379	19,874
Shale do.	425	604	600	482	454
Sulfur:					
S content of pyrites do.	319	493	503	465	474
Byproduct:					
Of metallurgy[e] do.	100	100	100	105	125
Of petroleum[e] do.	25	25	27	30	32
Total do.	444	618	630	600	631
Sulfuric acid, gross weight[6] do.	3,147	3,616	3,677	3,195	3,201

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Talc and related materials:					
Talc	9,451	9,466	9,464	9,743	7,617
Pyrophyllite (wonderstone)	5,795	4,900	5,662	4,070	3,575
Vermiculite	191,573	185,699	190,601	182,641	153,034
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[e]	45,000	45,000	45,000	NA	NA
Coal:					
Anthracite thousand tons	3,214	3,895	4,017	3,309	2,371
Bituminous do	100,459	111,225	126,403	136,828	143,467
Total[3] do	103,673	115,120	130,421	140,139	145,838
Coke, all types do	5,418	5,680	5,685	NA	NA
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	30,660	31,390	33,215	35,770	NA
Jet fuel do	2,555	2,920	2,920	3,285	
Kerosine do	3,285	3,285	3,650	3,650	
Distillate fuel oil do	33,580	34,310	35,405	37,230	
Residual fuel oil do	22,630	23,360	24,090	28,470	
Lubricants do	2,555	2,555	2,555	2,555	
Other do	6,205	6,205	8,395	11,315	
Refinery fuel and losses do	4,015	4,015	5,475	6,205	
Total do	105,485	108,040	115,705	128,480	NA

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.
[1] Table includes data available through Aug. 31, 1984.
[2] Less than 1/2 unit.
[3] Data may not add to totals shown because of independent rounding.
[4] Includes osmiridium from gold ores estimated at 2,500 troy ounces per year.
[5] Domestic sales plus exports.
[6] Sulfuric acid was produced from gases derived from local smelting operations and from burning imported elemental sulfur. Sulfur imports to the Republic of South Africa, in thousand metric tons, were as follows: 1979—749; 1980—936; 1981—552; 1982—590; and 1983—600.

Table 2.—Republic of South Africa: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	72	--		
Oxides and hydroxides	31,492	--		
Ash and residue containing aluminum	92	--		
Metal including alloys:				
Scrap	245	354	--	Japan 198; Belgium-Luxembourg 69; Netherlands 46.
Unwrought	178	11,221	1,496	West Germany 4,150; Taiwan 2,772; Japan 2,751.
Semimanufactures	11,492	3	1	West Germany 1; Sri Lanka 1.
Antimony:				
Ore and concentrate	2,339	1,135	99	Japan 912; Belgium-Luxembourg 124.
Oxides	4,175	2,903	2,903	
Arsenic: Oxides and acids	17	--		
Beryllium: Ore and concentrate	94	205	205	
Cadmium: Metal including alloys, all forms	16	--		
Chromium: Ore and concentrate thousand tons	1,311	852	251	Japan 312; West Germany 141; Austria 40.
Cobalt: Metal including alloys, all forms	[r]14	741	382	Japan 359.
Columbium and tantalum: Ore and concentrate kilograms	[2]4,061	[2]1,204	800	NA.

See footnotes at end of table.

Table 2.—Republic of South Africa: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Copper:				
Ore and concentrate	79,778	73,115	--	West Germany 41,518; Japan 31,054.
Matte and speiss including cement copper	123	222	--	West Germany 140; Greece 82.
Ash and residue containing copper	2,445	539	121	West Germany 418.
Metal including alloys:				
Scrap	2,848	9,720	--	Belgium-Luxembourg 3,296; United Kingdom 3,103; West Germany 3,073.
Unwrought	144,956	139,588	--	West Germany 72,604; Belgium-Luxembourg 28,934; Japan 15,952.
Semimanufactures	1,955	2,064	1,491	Hong Kong 249; United Kingdom 151.
Gold:				
Waste and sweepings troy ounces	[3]1,061	744	--	All to West Germany.
Metal including alloys, unwrought and partly wrought thousand troy ounces	963	630	(4)	West Germany 300; Japan 181; Hong Kong 110.
Iron and steel:				
Iron ore and concentrate:				
Including roasted pyrite	--	5,917	--	All to Switzerland.
Excluding roasted pyrite thousand tons	12,995	11,316	53	Japan 6,528; West Germany 3,088.
Metal:				
Scrap	1,746	3,549	18	Japan 1,664; Taiwan 664; Netherlands 597.
Pig iron, cast iron, related materials	[3]111,409	70,386	17,641	Japan 18,631; West Germany 8,175; Italy 6,685.
Ferroalloys:				
Ferrochromium	469,067	340,516	42,641	Japan 130,307; West Germany 122,198; Sweden 22,724.
Ferromanganese	303,324	298,993	219,914	Italy 36,505; West Germany 7,934; Peru 1,952.
Ferromolybdenum	135	--		
Ferronickel	12	16	6	West Germany 10.
Ferrosilicochromium	5,218	1,668	--	Japan 1,168; West Germany 500.
Ferrosilicomanganese	46,610	72,360	11,201	Japan 30,583; West Germany 15,308; Italy 10,171.
Ferrosilicon	12,378	17,480	--	Japan 14,880; West Germany 1,684.
Silicon metal	9,728	17,756	426	Japan 6,065; West Germany 5,522.
Unspecified	77,188	78,967	20	Italy 32,735; United Kingdom 30,207; Netherlands 9,208.
Steel, primary forms	43,202	197,787	105,790	Greece 24,341; United Kingdom 18,760; Italy 17,524.
Semimanufactures:				
Bars, rods, angles, shapes, sections	[3]351,987	327,227	116,227	West Germany 82,873; United Kingdom 62,675; Belgium-Luxembourg 27,338.
Universals, plates, sheets	[3]447,500	421,780	207,932	Taiwan 84,797; West Germany 43,140; Hong Kong 26,737.
Hoop and strip	[3]5,017	1,923	--	Taiwan 634; Greece 186.
Rails and accessories	151	205	--	Taiwan 199.
Wire	[3]10,248	7,281	2,630	Sri Lanka 3,317; Portugal 673.
Tubes, pipes, fittings	[3]63,733	75,157	47,315	Hong Kong 14,782; United Kingdom 5,478.
Castings and forgings, rough	23	57	--	Hong Kong 50.
Unspecified	77,188	--		
Lead:				
Ore and concentrate	145,404	47,574	--	West Germany 31,367; Japan 16,207.
Oxides	131	9	--	United Kingdom 6; West Germany 2.
Metal including alloys:				
Scrap	368	151	--	Denmark 98; Italy 53.
Unwrought	18,160	10,840	--	Italy 10,587; Taiwan 253.
Semimanufactures	80	56	--	Hong Kong 53; United Kingdom 3.
Magnesium: Metal including alloys:				
Scrap	[3]152	30	30	
Unwrought	16	57	21	Sweden 36.
Semimanufactures	NA	4	--	All to United Kingdom.
Manganese:				
Ore and concentrate:				
Battery-grade	--	18	--	All to Austria.
Metallurgical-grade thousand tons	2,912	2,170	120	Japan 1,037; Norway 286; West Germany 261.

See footnotes at end of table.

Table 2.—Republic of South Africa: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Manganese —Continued				
Oxides	292	531	--	Austria 180; Italy 96; Finland 90.
Metal including alloys, all forms	24,605	9,582	4,573	West Germany 3,367; Sweden 904.
Nickel:				
Ore and concentrate	74,095	--		
Matte and speiss	3,611	10,065	--	Norway 9,887; Italy 175.
Ash and residue containing nickel	--	5,608	5,608	
Metal including alloys:				
Scrap	1,989	151	--	United Kingdom 70; West Germany 55.
Unwrought	[3]15,566	12,031	3,826	Italy 2,779; West Germany 2,316.
Semimanufactures	1,116	638	633	Italy 5.
Platinum-group metals:				
Ore and concentrate value, thousands	--	$22	$22	
Waste and sweepings do.	--	$3,158	$3,057	West Germany $101.
Metals including alloys, unwrought and partly wrought:				
Palladium troy ounces	766,461	675,425	456,026	Japan 209,960; West Germany 9,439.
Platinum do.	1,500,129	1,177,386	563,184	Japan 585,366; West Germany 28,836.
Rhodium do.	66,543	51,190	41,667	Japan 9,523.
Iridium, osmium, ruthenium do.	122,921	34,586	--	All to Japan.
Unspecified value, thousands	$32,575	$159,845	$3,574	United Kingdom $137,528; Switzerland $8,708; West Germany $6,402.
Silver:				
Ore and concentrate[5] do.	$11,614	$111	--	Mainly to United Kingdom.
Waste and sweepings do.	$1	$317	$10	West Germany $244; Belgium-Luxembourg $63.
Metal including alloys, unwrought and partly wrought do.	$24,538	$21,710	--	United Kingdom $19,559; West Germany $1,947.
Tin:				
Ore and concentrate	2,174	1,747	--	United Kingdom 1,746.
Oxides	--	144	144	
Ash and residue containing tin	83	244	--	All to West Germany.
Metal including alloys:				
Scrap	20	--		
Unwrought	759	1,136	38	United Kingdom 668; Italy 325.
Semimanufactures	[3]3	1	--	All to United Kingdom.
Titanium:				
Ore and concentrate	139,611	42,642	10,269	Belgium-Luxembourg 10,718; West Germany 8,176.
Oxides	15	--		
Metal including alloys, all forms	86,680	--		
Tungsten:				
Ore and concentrate	21	5	--	All to West Germany.
Metal including alloys: Scrap	3,303	--		
Uranium and thorium:				
Ore and concentrate value, thousands	$52,367	--		
Oxides and other compounds	1,533	3,451	3,451	
Vanadium:				
Oxides and hydroxides	3,995	4,469	136	Japan 3,593; Belgium-Luxembourg 679.
Ash and residue containing vanadium	11,140	--		
Zinc:				
Ore and concentrate	42,781	69,567	--	West Germany 59,845; Netherlands 4,939.
Oxides	7	--		
Matte	--	101	--	All to West Germany.
Ash and residue containing zinc	--	126	--	Do.
Metal including alloys:				
Scrap	--	17	--	All to Italy.
Unwrought	994	648	22	Taiwan 304; Indonesia 150; Hong Kong 100.
Semimanufactures	34	24	--	United Kingdom 17; Taiwan 7.
Zirconium: Ore and concentrate	85,059	72,934	10,526	West Germany 25,484; Japan 23,936; Netherlands 7,265.
Other:				
Ores and concentrates	51,027	73,761	--	West Germany 33,761; Netherlands 13,441; Italy 10,051.
Oxides and hydroxides	--	701	--	Belgium-Luxembourg 679; United Kingdom 22.

See footnotes at end of table.

Table 2.—Republic of South Africa: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Other —Continued				
Ashes and residues	100,322	120,835	--	West Germany 58,981; Italy 46,144.
Base metals including alloys, all forms	[3]6,557	46,709	268	Hong Kong 28,835; Japan 12,186; Netherlands 2,652.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1,516	86	1	Austria 85.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$6,869	$549	--	West Germany $532; Italy $12; Japan $5.
Grinding and polishing wheels and stones	NA	627	--	Netherlands 567; Belgium-Luxembourg 53.
Asbestos, crude	NA	120,934	11,392	Japan 50,283; Italy 17,512; Taiwan 12,399.
Barite and witherite	3,293	--		
Cement	[3]57,220	87,564	--	Reunion 86,758; Italy 760.
Clays, crude:				
Bentonite	[2]1,798	[2]995	4	Taiwan 18.
Chamotte earth	NA	11,428	--	All to West Germany.
Fire clay	--	5,848	--	Do.
Flint clay	[2]51,128	[2]39,443	NA	NA.
Kaolin	[r] [2]1,316	[2]1,387	NA	NA.
Unspecified	106,797	31,376	--	Japan 17,764; Italy 12,588.
Diamond:				
Gem, not set or strung value, thousands	$574,837	$392,203	$275,499	Belgium-Luxembourg $52,861; United Kingdom $43,898.
Industrial do	$63,198	$45,649	$32,210	West Germany $6,009; Japan $5,944; Belgium-Luxembourg $1,125.
Diatomite and other infusorial earth do	--	$33	$33	
Feldspar, fluorspar, related materials:				
Feldspar	[2]2,018	[2]1,389	--	West Germany 343.
Fluorspar	[2]403,092	279,758	148,217	Japan 69,628; West Germany 51,191.
Unspecified	399,775	1,036	--	United Kingdom 1,000; Switzerland 36.
Fertilizer materials:				
Crude, n.e.s	3,255	--		
Manufactured:				
Ammonia	--	2	--	All to Sri Lanka.
Nitrogenous	197	366	--	Denmark 300; West Germany 66.
Phosphatic	10,624	10,263	--	West Germany 10,233.
Unspecified and mixed	422	55	--	Seychelles 30; United Kingdom 23.
Graphite, natural	541	437	211	United Kingdom 178; Portugal 48.
Gypsum and plaster	[2]2,604	[2]2,769	1	NA.
Kyanite and related materials:				
Andalusite	[2]60,047	[2]76,714	--	West Germany 29,825; Japan 21,759; Italy 12,525.
Sillimanite	[2]8,982	[2]6,309	NA	NA.
Lime	[2]68,908	[2]59,840	--	Reunion 140; unspecified 59,700.
Magnesium compounds: Magnesite	2,513	201	--	Austria 180; Italy 21.
Mica: Crude including splittings and waste	973	1,212	--	United Kingdom 631; West Germany 332; Japan 173.
Phosphates, crude	NA	124,734	--	Denmark 69,010; Japan 23,900; Taiwan 11,000.
Phosphorus, elemental	401	276	--	Taiwan 199; Belgium-Luxembourg 77.
Pigments, mineral:				
Natural, crude	[r] [2]356	[2]363	18	NA.
Iron oxides and hydroxides, processed	18	56	--	All to United Kingdom.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$11,500	$6,061	$2,161	West Germany $1,692; Switzerland $1,316.
Synthetic do	$17	$3	--	All to Norway.
Salt and brine	[r] [2]68,708	[2]67,197	--	Colombia 2,682; Reunion 524.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	753	155	NA	Italy 60; West Germany 36; Japan 35.
Worked	[2]197	1,763	NA	United Kingdom 1,514; West Germany 188.

See footnotes at end of table.

Table 2.—Republic of South Africa: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Gravel and crushed rock	636	12,227	--	All to United Kingdom.
Limestone other than dimension	[r] [2]68,908	[2]54,940	NA	NA.
Quartz and quartzite	943	29,287	23,060	West Germany 4,925; Japan 624; Netherlands 535.
Sand other than metal-bearing	9,661	7,548	--	Belgium-Luxembourg 7,546.
Sulfur:				
Elemental, all forms	[2]66,091	[2]31,867	NA	NA.
Sulfuric acid	--	90	--	All to Finland.
Talc, steatite, soapstone, pyrophyllite	NA	44	--	All to West Germany.
Vermiculite	[2]184,152	[2]146,094	--	Italy 21,894; Belgium-Luxembourg 2,187.
Other: Crude	73,114	64,859	NA	Italy 21,353; United Kingdom 18,591; West Germany 7,093.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	2,455	4,532	--	All to United Kingdom.
Coal:				
Anthracite and bituminous thousand tons	[r]29,891	[2]27,695	512	Japan 5,889; Belgium-Luxembourg 3,233; Italy 3,186.
Briquets of anthracite and bituminous coal	86,088	10,651	10,647	Belgium-Luxembourg 4.
Lignite including briquets	7	72	--	Belgium-Luxembourg 64; West Germany 8.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	NA	1,632	1,130	United Kingdom 254.
Mineral jelly and wax do	184	109	77	United Kingdom 18; West Germany 6.
Lubricants do	3,006	9	(4)	Reunion 8.
Residual fuel oil do	1,283	8	--	Mainly to Japan.
Bitumen and other residues do	60	55	--	All to Reunion.

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[r]Revised. NA Not available.

[1] Table prepared by Virginia A. Woodson. Because official South African trade statistics provide data only on the value of total exports of each commodity class (with no data on destinations) and not on quantity of material exported, this table has been compiled from a variety of sources including the quarterly publication "Minerals" issued by the Republic of South Africa Department of Mines as well as official trade returns of trading partner countries. Data from "Minerals" is footnoted; other figures are compiled from a variety of sources with specifics on destination obtained from the import statistics of the countries listed. Data presented are exports by the common customs areas of Botswana, Lesotho, the Republic of South Africa, and Swaziland.

[2] "Minerals" quarterly of the Department of Mines. Oct.-Dec. 1982. Figures are shipments by producers for export and are not necessarily actual exports.

[3] Incomplete total. Excludes imports expressed only in value.

[4] Less than 1/2 unit.

[5] May include platinum-group metals.

Table 3.—Republic of South Africa: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	15,304	26,966	--	Denmark 12,350; Australia 9,651.
Oxides and hydroxides	180,066	277,232	--	Australia 266,087; United Kingdom 4,510.
Metal including alloys:				
Scrap	9,160	2,678	232	United Kingdom 986; West Germany 373; Australia 71.
Unwrought	2,417	633	--	United Kingdom 222; West Germany 107.
Semimanufactures	15,574	12,620	1,839	West Germany 4,719; United Kingdom 1,522; Japan 961.
Arsenic:				
Oxides and acids	190	1	--	NA.
Metal including alloys, all forms	12	14	10	Sweden 3.

See footnotes at end of table.

Table 3.—Republic of South Africa: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Beryllium: Metal including alloys, all forms value	$487	$1,410	NA	NA.
Chromium:				
Ore and concentrate	8,147	121	NA	NA.
Oxides and hydroxides	566	485	88	West Germany 229; Italy 153.
Cobalt:				
Oxides and hydroxides	15	9	1	United Kingdom 4.
Metal including alloys, all forms	82	77	15	Canada 17; Belgium-Luxembourg 12; United Kingdom 7.
Columbium and tantalum: Metal including alloys, all forms, tantalum kilograms	1,200	100	100	
Copper:				
Ore and concentrate	2,040	--		
Oxides and hydroxides	--	127	--	Norway 57.
Metal including alloys:				
Scrap	376	107	--	United Kingdom 62.
Unwrought	5,180	3,044	11	Australia 75; United Kingdom 62; West Germany 41.
Semimanufactures	14,878	8,398	296	West Germany 1,618; United Kingdom 972; Japan 536.
Gold:				
Waste and sweepings value, thousands	$988	$454	$50	United Kingdom $336; Australia $64.
Metal including alloys, unwrought and partly wrought[2] troy ounces	8,798	3,196	NA	West Germany 1,223; France 574; Switzerland 108.
Iron and steel:				
Iron ore and concentrate including roasted pyrite	38	10,440	NA	West Germany 10,400.
Metal:				
Scrap	12,462	27,462	NA	United Kingdom 453; unspecified 27,009.
Pig iron, cast iron, related materials	22,476	9,943	206	Sweden 1,755; Switzerland 551; unspecified 6,724.
Ferroalloys:				
Ferrochromium	6,027	7,626	21	Sweden 12; unspecified 7,593.
Ferromanganese	300	91	--	United Kingdom 81; West Germany 8.
Ferrosilicon	2,601	1,955	--	Brazil 814; France 766; West Germany 217.
Silicon metal	81	46	--	France 33; United Kingdom 7.
Unspecified	968	840	3	United Kingdom 302; Belgium-Luxembourg 194; Brazil 122.
Steel, primary forms	14,688	42,787	NA	West Germany 3,866; France 222; unspecified 38,397.
Semimanufactures:				
Bars, rods, angles, shapes, sections	48,871	32,071	259	United Kingdom 5,252; West Germany 3,490; Japan 3,511.
Universals, plates, sheets	59,416	55,900	632	Japan 33,639; West Germany 11,242; Italy 4,150.
Hoop and strip	18,078	14,716	3,853	West Germany 2,628; France 1,808; Japan 1,470.
Rails and accessories	1,788	1,036	120	West Germany 217; Switzerland 90; unspecified 582.
Wire	35,333	22,810	176	United Kingdom 4,938; Belgium-Luxembourg 2,683; Italy 1,827.
Tubes, pipes, fittings	73,372	60,631	1,510	Japan 30,459; West Germany 11,216; United Kingdom 3,751.
Castings and forgings, rough	675	509	6	West Germany 195; United Kingdom 145.
Lead:				
Ore and concentrate	17	15	--	All from Argentina.
Oxides	27	18	4	West Germany 10.
Metal including alloys:				
Scrap	7,752	12,734	8,033	Taiwan 3,785; United Kingdom 291.
Unwrought	9,405	3,976	--	United Kingdom 677; Canada 201; unspecified 3,018.
Lithium:				
Ore and concentrate	870	1,163	NA	NA.
Oxides and hydroxides	--	33	33	
Magnesium: Metal including alloys:				
Unwrought	500	408	389	Norway 19.
Semimanufactures	62	97	89	Switzerland 3.

See footnotes at end of table.

Table 3.—Republic of South Africa: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Manganese:				
Ore and concentrate, metallurgical-grade	7,052	4,351	--	United Kingdom 2,769; Belgium-Luxembourg 246.
Oxides	6,213	10,039	--	Belgium-Luxembourg 8,364; Greece 1,191.
Mercury 76-pound flasks	2,735	1,828	174	Spain 1,189; Turkey 261.
Molybdenum:				
Oxides and hydroxides	170	138	--	Chile 101; Canada 25.
Metal including alloys, all forms	10	11	5	Austria 5.
Nickel:				
Matte and speiss	150	560	124	Canada 436.
Metal including alloys:				
Unwrought	522	103	NA	NA.
Semimanufactures	748	534	19	West Germany 164; United Kingdom 138; Japan 74.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	26,053	61,098	13,598	United Kingdom 6,366; West Germany 4,279.
Selenium, elemental	9	13	3	United Kingdom 10.
Silver:				
Ore and concentrate[3] value, thousands	$45,560	$44,308	--	All from Norway.
Waste and sweepings[3] do	$784	$586	NA	United Kingdom $396.
Metal including alloys, unwrought and partly wrought troy ounces	834,458	892,601	4,568	United Kingdom 475,610; West Germany 392,165.
Tellurium, elemental value, thousands	$4	$1	NA	NA.
Tin:				
Ore and concentrate	89	5	NA	NA.
Metal including alloys:				
Scrap	352	NA		
Unwrought	276	41	NA	NA.
Semimanufactures	23	29	NA	United Kingdom 9; unspecified 10.
Titanium:				
Ore and concentrate	43	54	NA	West Germany 52.
Oxides	1,731	1,032	804	West Germany 161.
Tungsten:				
Ore and concentrate	400	388	18	Canada 162; Brazil 132.
Metal including alloys, all forms	39	13	3	West Germany 1; United Kingdom 1.
Zinc:				
Oxides	803	771	--	West Germany 625; Belgium-Luxembourg 65.
Blue powder	--	451	--	United Kingdom 331; West Germany 102.
Metal including alloys:				
Scrap	1,160	520	NA	United Kingdom 56; unspecified 464.
Unwrought	8,287	3,851	2,499	NA.
Semimanufactures	709	106	--	West Germany 86; United Kingdom 19.
Zirconium: Ore and concentrate	140	75	--	All from Australia.
Other:				
Ores and concentrates	147	105	99	NA.
Oxides and hydroxides	1,027	510	61	United Kingdom 211; West Germany 64.
Ashes and residues	8,455	2,216	16	West Germany 1,505; Netherlands 480.
Base metals including alloys, all forms	437	321	100	United Kingdom 117; France 36.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	3,875	1,777	157	Italy 47; United Kingdom 39; unspecified 1,485.
Artificial:				
Corundum	5,285	4,290	1,937	West Germany 1,171; United Kingdom 454.
Silicon carbide	3,043	2,257	150	Norway 1,470; West Germany 260.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$348	$167	--	United Kingdom $151.
Grinding and polishing wheels and stones	657	705	129	West Germany 111; Spain 111; United Kingdom 95.
Asbestos, crude	29,231	12,878	24	Canada 1,000; Sweden 38; unspecified 11,800.

See footnotes at end of table.

Table 3.—Republic of South Africa: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Barite and witherite	3,693	1,789	--	United Kingdom 476; West Germany 265; Australia 214.
Boron materials:				
Crude natural borates	4,250	5,498	245	Netherlands 2,668; Turkey 2,080.
Elemental ---- value, thousands	$17	$3	NA	NA.
Oxides and acids	722	920	27	France 638; Argentina 76; Brazil 76.
Bromine	94	55	--	All from Israel.
Cement	124,586	194,239	--	France 12,677; West Germany 2,187.
Chalk	9,877	7,988	235	France 5,729; Sweden 1,476.
Clays, crude	r32,827	30,941	22,017	United Kingdom 6,739; West Germany 497.
Cryolite and chiolite	160	115	--	Denmark 71; West Germany 44.
Diamond:				
Gem, not set or strung thousand carats	166	239	14	Belgium-Luxembourg 31; Israel 12; Switzerland 5.
Industrial do	2,144	1,384	140	United Kingdom 1,033; Ireland 146.
Diatomite and other infusorial earth	7,544	7,172	6,699	NA.
Fertilizer materials: Manufactured:				
Ammonia	77,034	79,524	38,602	Brazil 33,115; France 125.
Nitrogenous	361,218	314,097	39,595	West Germany 31,445; Netherlands 11,423.
Phosphatic	690	141	--	Belgium-Luxembourg 72; Israel 69.
Potassic	197,335	144,835	7	Israel 52,547; Canada 48,373; West Germany 23,322.
Unspecified and mixed	75,968	83,883	82,733	Belgium-Luxembourg 648; Netherlands 268.
Graphite, natural	1,261	1,630	--	Norway 680; Brazil 157; Republic of Korea 108.
Gypsum and plaster	8,049	7,026	43	West Germany 4,696; Spain 1,254; United Kingdom 1,012.
Kyanite and related materials	245	308	--	West Germany 193; Japan 87.
Lime	7,829	9,225	118	France 3,018; unspecified 6,089.
Magnesium compounds:				
Magnesite	92,876	69,693	--	Greece 6,127; West Germany 2,134; Japan 1,013.
Other	1,214	36,223	86	Republic of Korea 18,857; Italy 8,223; United Kingdom 6,471.
Mica:				
Crude including splittings and waste	948	545	7	NA.
Worked including agglomerated splittings	88	65	9	Belgium-Luxembourg 24; United Kingdom 12.
Phosphates, crude	20	16	14	NA.
Phosphorus, elemental	53	69	--	All from United Kingdom.
Pigments, mineral:				
Natural, crude	354	372	--	Austria 300; United Kingdom 35.
Iron oxides and hydroxides, processed	10,444	6,857	39	West Germany 5,804; United Kingdom 863.
Potassium salts, crude	75,548	64,844	--	France 22,638; West Germany 18,837; Canada 16,783.
Precious and semiprecious stones other than diamond:				
Natural ----- value, thousands	$1,529	$1,071	$68	Hong Kong $125; Switzerland $188; Brazil $102; West Germany $62.
Synthetic do	$4,593	$6,896	$346	Ireland $3,172; Canada $223; Switzerland $85.
Pyrite, unroasted	5,090	170	42	West Germany 63; France 54.
Salt and brine	25,667	1,153	1	West Germany 606; United Kingdom 456.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	215,283	254,214	136,481	United Kingdom 81,911; West Germany 5,132.
Sulfate, manufactured	24,692	27,276	5,275	West Germany 8,130; Belgium-Luxembourg 5,797; Spain 4,381.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,802	1,666	--	Italy 1,141; Portugal 192.
Worked	1,550	1,411	--	Italy 1,175; Portugal 104; Taiwan 60.
Gravel and crushed rock	2,458	183	--	Australia 71; West Germany 4.
Quartz and quartzite	472	4,450	4,222	NA.
Sand other than metal-bearing	151	376	122	West Germany 107; Israel 98.
Sulfur:				
Elemental:				
Crude including native and byproduct	764,885	590,201	14,631	Canada 575,337.
Colloidal, precipitated, sublimed	2,177	136	1	West Germany 113; United Kingdom 22.
Sulfuric acid	158,036	130,574	--	Japan 77,333; Belgium-Luxembourg 18,895.

See footnotes at end of table.

Table 3.—Republic of South Africa: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Talc, steatite, soapstone, pyrophyllite	2,676	2,503	339	Republic of Korea 847; Belgium-Luxembourg 351; Norway 342.
Other:				
Crude	8,874	9,397	10	Greece 8,461; Australia 678.
Slag and dross, not metal-bearing	2,626	2,124	110	Taiwan 975; France 221.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	555	302	134	NA.
Carbon: Carbon black and gas carbon	4,354	3,416	789	Canada 1,184; West Germany 852.
Coal:				
Bituminous	51,515	795	NA	NA.
Lignite including briquets	--	23,008	23,008	
Peat including briquets and litter	363	665	--	Finland 316; Canada 218; Ireland 93.
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	921	186	35	West Germany 70; United Kingdom 35.
Mineral jelly and wax do	406,132	444,143	51,297	Japan 188,352; West Germany 9,184.
Lubricants do	16,141	13,958	3,493	West Germany 4,935; United Kingdom 4,809; Belgium-Luxembourg 259.
Bitumen and other residues do	1,422	1,394	794	NA.
Bituminous mixtures do	2,534	4,326	1,342	Italy 1,158; United Kingdom 844; Netherlands 555.
Petroleum coke do	512,616	505,318	341,171	Japan 87,148; West Germany 76,967.

^{r}Revised. NA Not available.

[1] Table prepared by Virginia A. Woodson. Data presented are imports by the common customs areas of Botswana, Lesotho, the Republic of South Africa, and Swaziland released by the Commissioner for Customs and Excise of the Republic of South Africa.

[2] May include platinum-plated gold.

[3] May include platinum-group metals.

Table 4.—Republic of South Africa: Value of domestic sales and exports of major mineral commodities

(Thousand U.S. dollars)

Commodity	Domestic sales			Exports		
	1981	1982	1983^{p}	1981	1982	1983^{p}
METALS						
Antimony	10,490	10,978	16,381	7,158	870	1,137
Chromite	38,357	26,209	44,796	60,807	42,466	36,042
Copper	165,705	^{r}126,449	122,811	163,288	^{r}151,700	192,896
Gold	(1)	(1)	(1)	9,831,548	8,101,564	9,153,026
Iron ore	157,149	^{r}122,040	119,788	248,538	216,648	158,860
Lead concentrate	--	--	--	49,146	^{r}35,116	25,562
Manganese	55,625	52,471	22,080	134,701	124,442	77,017
Nickel	12,084	^{r}9,079	11,061	66,194	36,911	36,848
Silver	4,080	1,226	3,101	60,059	^{r}47,841	68,235
Tin	19,089	14,989	9,370	16,042	20,122	21,905
Titanium	5,276	4,493	5,337	13,117	11,966	9,646
Uranium^{e}	NA	NA	NA	300,000	300,000	250,000
Vanadium^{e}	50	50	50	65,000	65,000	60,000
Zinc	26,963	23,027	36,944	6,973	12,892	4,627
Zirconium	534	445	676	14,414	18,141	22,551
NONMETALS						
Asbestos	11,489	8,759	5,924	123,330	^{r}90,654	95,925
Cement^{e}	280,000	300,000	300,000	35,000	35,000	35,000
Clays:						
Flint	4,902	^{r}2,968	2,540	4,684	^{r}3,550	2,327
Other	9,859	^{r}6,415	7,027	77	60	26
Diamond	(1)	(1)	(1)	390,562	^{r}315,237	472,223
Feldspar	3,635	3,056	3,093	279	144	54
Fluorspar	3,207	2,762	2,642	52,007	24,431	25,000
Granite	2,300	1,763	1,839	21,528	17,023	23,612
Gypsum	5,376	4,944	5,410	34	33	40

See footnotes at end of table.

Table 4.—Republic of South Africa: Value of domestic sales and exports of major mineral commodities —Continued

(Thousand U.S. dollars)

Commodity	Domestic sales			Exports		
	1981	1982	1983[p]	1981	1982	1983[p]
NONMETALS —Continued						
Kyanite-related materials:						
Andalusite	11,555	5,850	5,391	7,100	[r]8,311	7,081
Sillimanite	784	570	289	2,251	1,295	430
Lime products	95,977	83,512	87,000	2,766	1,974	2,722
Limestone	64,584	[r]56,875	55,336	151	178	107
Magnesite	2,154	2,479	1,765	28	--	24
Mica	306	298	319	495	356	373
Phosphate rock	73,009	63,797	55,581	764	5,887	11,196
Pyrite-sulfur	38,993	[r]37,588	42,633	2,523	1,131	526
Salt	17,308	[r]17,450	18,887	2,445	1,720	3,448
Sand, silica	20,173	[r]14,621	15,951	351	283	70
Slate	2,599	[r]1,959	2,137	2,656	[r]2,097	2,128
Stone, other	1,567	1,532	1,562	539	330	240
Vermiculite	407	346	387	14,319	11,662	9,336
Wonderstone	195	254	238	1,090	467	333
Miscellaneous	[r]242,726	[r]201,889	236,408	[r]505,300	[r]378,013	538,572
MINERAL FUELS						
Coal:						
Anthracite	31,517	[r]15,559	12,301	194,312	77,602	56,747
Bituminous	1,274,886	[r]1,289,066	1,253,096	928,430	[r]1,034,257	961,418
Total	[r]2,694,910	[r]2,515,768	2,510,151	13,330,006	[r]11,197,374	12,367,310

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Value, if any, is included under exports.

Sources: Republic of South Africa Department of Mines. Quarterly Information Circular, Minerals, Oct.-Dec. 1981-82; Commodity Summaries for Monthly and Annual Periods, 1982, 1983; and Annual Report of the Department of Mineral and Energy Affairs, 1982, 1983.

COMMODITY REVIEW

METALS

Antimony.—AVL's subsidiary, Consolidated Murchison Ltd. (CML), was the world's largest and the country's only antimony producer from several mines aligned in a nearly east-west-trending zone in the eastern part of the Transvaal Province. From the 426,258 tons of ore mined and 6,542 tons from the mill bins, 432,800 tons was milled yielding 10,670 tons of stibnite concentrate containing 59% antimony. The concentrate was converted to crude antimony oxide fire retardant in a thermal plant operated on CML property by Antimony Products Ltd., which was jointly owned by CML and the U.S. consumers of the product. Of the 18,683 troy ounces of byproduct gold, 13,570 troy ounces was recovered on corduroy tables in the concentrator, 3,663 ounces came from cyanidation and recovery in the new pipe reactor, and 1,450 troy ounces was in thermal plant slag. Gross mining income reported by CML was $24 million including $7.5 million for gold sales, which resulted in an aftertax net profit of $5.3 million.

Chromite.—The production of chromite increased slightly in 1983, but exports were 7% below the record low of 1982 as ferrochromium producers began depletion of accumulated chromite stocks in response to the demand for chromium alloys. Gencor's subsidiary, Transvaal Mining and Finance Co. Ltd., closed its Milsell Mine.

Copper.—Copper production increased nearly 6% to 204,984 tons of smelter metal. Local consumption was down nearly 9%, but the volume of export sales increased 16.5% to 134,902 tons, and its value rose 27% to nearly $193 million. The continuing profitability of PMC, a subsidiary of Rio-Tinto Zinc Corp. Ltd., was a tribute to the long-range planning and continued application of a number of cost-cutting measures introduced into all stages of shipping, mining, concentrating, smelting, and refining. Its pretax profits increased nearly 18% to $56.3 million. The PMC operation mined and treated 28.9 million tons of ore at a grade of 0.51% copper and produced 332,453 tons of 36.5% concentrate. The smelter produced 120,679 tons of anode copper from PMC's concentrate and 14,274 tons of anode smelted on toll or from purchased material. Total cathode from the refinery was 138,738 tons including a record high 124,852 tons from PMC's sources and 13,886 tons from other producers. Byproducts included 48,737 tons of magnetite concentrate, 127,855 tons of sulfuric acid, 219 tons of uranium oxide concentrate, 5,531 tons of zirconium dioxide chemicals produced from baddeleyite concentrate, 139,292 tons of vermiculite, and nearly 20 tons of precious metals in refinery slimes.

Messina Ltd.'s mine, near the Limpopo River northwest of the PMC structure, mined and treated 719,000 tons of 1.59% copper ore. Messina's smelter produced 11,296 tons of copper ingots including 2,586 tons of blister copper. For the 15-month period ended December 31, 1983, the company reported a working loss of $143,000. Its working costs were nearly $0.82 per pound; its average sale price was $0.68 per pound. Most of the ore came from the No. 5 shaft, as operations at the Artonvilla Section ceased in April. Future cost-cutting plans included shutting down the smelter, continuing to extract high-grade ore only from the Campbell Section until shutdown in June 1984 and from the No. 5 shaft until shutdown in September 1984. The final installment of $1.17 million of a state loan was received during 1983, but the availability of further interest-free assistance from the Government will determine whether the Messina operation can continue without a substantial increase in the price of copper. With the exclusion of the Artonvilla Section, ore reserves were reported at 2.9 million tons of 1.59% copper ore.

The O'okiep Copper Co. Ltd. produced nearly 1.6 million tons of 1.49% copper ore at its Carolusberg and Spiktakel concentrators from the Carolusberg, Hoits, and Spiktakel Mines in the small high-grade deposit near Schaaprivier. The Koperberg ore was depleted early in the year. Approximately 63,000 tons of concentrate containing 34% copper was smelted to produce 21,164 tons of blister copper. An additional 14,543 tons of blister ingot was produced from concentrates smelted on toll. Sales of 18,245 tons of blister copper at an average price of $0.81 per pound produced a total revenue of nearly $32.5 million, $1.76 million less than production costs of $33.7 million or $0.84 per pound. The vertical crater retreat mining method was commenced at the Carolusberg Deep ore body in mid-1983, but operations were disrupted for 2 months in July by a runaway skip that damaged the headgear and all installations along the 1,690-meter shaft. Fortunately, none of the miners were injured. The underground crusher was commissioned at the Spiktakel Mine, and ore hoisting replaced trucking in August. Pillar recovery accounted for most of the ore at the Hoits Mine. Ore reserves at yearend included 19.8 million tons of sulfite ore containing 1.87% copper and nearly 1 million tons of oxide ore with 1.13% copper. About 1.1 million tons of 1.36% copper ore was removed from previous reserves as being uneconomic or unrecoverable.

Prieska Copper Mines (Pty.) Ltd., 52% owned and managed by AVL, with United States Steel Corp. as a minority partner, had a gross turnover of nearly $70.8 million, slightly lower than that of 1982. The net profit from its zinc-copper-pyrite mine near Copperton, west of Prieska, increased 670% to nearly $10 million, chiefly because of a drastic reduction in the cost of sales of its copper, zinc, and pyrite concentrates. AVL anticipated mining the last of the Prieska ore body during the latter half of 1985. In 1983, the Black Mountain Mineral Development Co. (Pty.) Ltd., 51% owned by GFSA and 49% by the Phelps Dodge Corp. of the United States, produced 1.2 million tons of ore, from which its concentrator recovered substantial quantities of lead, silver, and zinc concentrates as well as 4,286 tons of copper in concentrate. The concentrates were trucked to the Sishen-Saldanha Railway and shipped from Saldanha Bay.

Gold.—Gold production increased 2.3% to 21,847,310 troy ounces, with sales of $9.15 billion. The average price realized was $419 per troy ounce. Most of the gold output came from 34 mining and 2 tailings retreatment operations; of which, all but 1 were managed or partly owned by 1 or more of 6 multinational mining corporations. The 34 mining operations milled nearly 100 million tons of gold ore at an average grade of nearly 0.211 troy ounce of gold per ton or 96% of the country's production. Their collective working revenue was nearly $9 billion or an average of $90 per ton of ore milled. Each of the major operations produced gold bullion in ingots containing about 88% gold, 10% silver, and 2% impurities. The ingots were delivered to the Rand Refinery Ltd. at Germiston where they were assayed and purchased on behalf of the Reserve Bank of South Africa. Payment to the producing mine was generally made within 5 days. As an alternative to the rapid

Table 5.—Republic of South Africa: Gold production and ore reserves, by producer

Producer	Production (troy ounces)				Developed ore	
	1980	1981	1982	1983[p]	Thousand metric tons	Troy ounces per ton
AAC's Joint Metallurgical Scheme	73,824	112,405	114,981	115,592	NA	NA
Barberton	49,998	38,098	38,160	45,252	NA	NA
Blyvooruitzicht	580,302	604,254	643,372	593,708	5,109	0.672
Bracken	112,849	112,064	106,544	115,103	1,800	.177
Buffelsfontein	854,554	904,506	883,827	966,204	10,651	.315
Consolidated Murchison Ltd	11,860	17,580	16,551	18,683	NA	NA
Deelkraal	101,731	171,530	217,574	204,746	2,791	.190
Doornfontein	391,972	382,256	348,440	319,533	4,619	.301
Driefontein Consolidated Ltd.:						
East Driefontein	1,263,556	1,168,557	1,134,433	1,092,511	12,647	.436
West Driefontein	1,407,952	1,275,333	1,333,809	1,270,662	7,566	.530
Durban Deep	233,984	265,173	269,195	251,863	4,013	.154
East Rand Gold and Uranium Co. Ltd. (Ergo)	220,908	202,453	187,567	197,341	NA	NA
East Rand Proprietary Mine	378,491	373,984	343,814	357,037	4,458	.264
Elandsrand	168,804	167,322	261,652	316,955	2,696	.260
Free State Geduld	1,035,964	883,833	816,671	873,803	8,642	.408
Free State Saaiplaas	154,053	(1)	(1)	(1)	(1)	(1)
Grootvlei	204,337	210,372	229,367	227,505	4,240	.162
Harmony	1,004,646	1,027,087	1,021,333	1,042,295	29,550	.206
Hartebeestfontein	1,032,679	981,661	959,876	968,663	19,940	.386
Kinross	293,205	310,399	322,141	392,866	9,000	.248
Kloof	972,390	957,034	893,742	978,852	4,581	.623
Leslie	118,035	128,429	125,729	125,308	1,700	.183
Libanon	347,161	325,597	343,129	328,423	9,724	.255
Loraine	171,743	211,445	260,749	270,960	6,763	.265
Marievale	43,989	39,124	35,848	39,381	350	.148
President Brand	955,469	859,379	807,418	771,165	8,641	.367
President Steyn	837,758	787,747	801,611	834,292	14,451	.316
Randfontein	669,272	761,297	869,838	952,903	9,283	.302
St. Helena	533,988	500,555	469,828	444,204	11,300	.289
St. Helena-Beisa	--	--	20,708	44,918	1,300	.080
Stilfontein	559,034	478,766	401,100	396,354	3,947	.354
Unisel	184,240	235,681	277,782	296,494	3,900	.246
Vaal Reefs	2,246,565	2,363,314	2,531,865	2,572,281	30,651	.384
Venterspost	190,554	181,291	208,353	195,785	9,973	.187
Welkom	365,004	(1)	(1)	(1)	(1)	(1)
West Rand Consolidated	86,402	90,957	122,478	127,960	6,772	.193
Western Areas	628,676	569,261	544,087	582,732	5,407	.245
Western Deep Levels	1,466,743	1,254,293	1,269,179	1,268,501	5,814	.581
Western Holdings	918,074	1,339,969	1,290,955	1,287,296	16,179	.310
Winkelhaak	456,949	447,933	422,313	467,842	12,000	.215
Witwatersrand Nigel	33,112	36,156	30,498	27,653	1,313	.176
Other	[r]308,641	[r]344,042	[r]378,594	463,684	NA	NA
Total or average	21,669,468	21,121,137	21,355,111	21,847,310	291,771	.317

[p] Preliminary. NA Not available.

[1] Free State Saaiplaas and Welkom production and reserves included with Western Holdings after merger during 1981.

Sources: Chamber of Mines of South Africa. Quarterly Analysis of Working Results, Oct.-Dec. 1980-83; supplement to the Mining Journal (London), 1980-84.

renumeration system, the gold producers were allowed the option of hedging against currency fluctuations by committing their production to a gold price fixed in South African rand for 1 year or more in advance, thus allowing marginal mines to arrange their capital expenditures more advantageously.

More than 100 tons of the gold was delivered to the South African mint at Pretoria, to be minted into coins and sold by the International Gold Corp. on behalf of the Chamber of Mines of South Africa. In 1983, the mint reported striking 2,700,000 of the 1-ounce Krugerrand coins, 450,000 of the 1/2-ounce coins, 1,300,000 of the 1/4-ounce coins, and 1,100,000 of the 1/10-ounce coins, as well as 12,000 each of 1-rand and 2-rand denominations. The total weight of gold coins minted was 3,500,000 troy ounces.

The average production cost per ton of gold ore mined and milled increased nearly 7% to $46.64, equivalent to nearly $215 per troy ounce of gold produced. The mines' working revenue averaged nearly $93 per ton of ore milled, equivalent to $427 per troy ounce of gold recovered, leaving an average working profit of more than $46 per metric ton of ore treated or nearly $213 per troy ounce of gold recovered. Maximum profitability was reported from GFSA's Kloof Mine at nearly $148 per ton of ore milled or $302 per troy ounce of gold recovered. GFSA's Dreifontein East and Dreifontein West Mines reported profits of $120 and nearly $134 per ton of ore treated or $309 and $303 per troy ounce of gold recovered, respectively. Despite the increase in average gold price and the reduced value of the South African rand, operating costs increased slightly and there was little increase in the expenditure of capital for major expansion programs except in the form of surface and underground drilling to develop extensions or new ore that could be handled, at least partially, through existing facilities.

Iron Ore and Concentrate.—Production at Iscor's Sishen Mine in northern Cape Province decreased 44% to 10.9 million tons of beneficiated hematite ore, but output at the Thabazimbi Mine in western Transvaal Province decreased only 4% to 2.2 million tons in 1983. AAC's Highveld Steel and Vanadium Corp. Ltd. produced more than 50% of the country's magnetite ore from its Mapoch Mine in the Bushveld Igneous Complex northeast of Pretoria. The export sales value of hematite ore decreased 27% to nearly $159 million, increasing substantially the losses incurred from the 861-kilometer automated railroad from the mine at Sishen to the loading facilities at Saldanha Bay.

Iron, Steel, and Ferroalloys.—More than 60% of Iscor's Sishen Mine ore and virtually all of Thabazimbi Mine output was consumed in Iscor's iron and steel plants at Vanderbijlpark and Pretoria in Transvaal Province and the Newcastle Works in Natal Province. Consumption at the Pretoria Works was below normal because of the rationalization program there. In Iscor's 1982-83 fiscal year ended June 30, 1983, production of liquid iron decreased 27% from fiscal year 1981-82 output to 4.7 million tons. At the Vanderbijlpark Works, the decrease was only 14% to 2.5 million tons. At Newcastle, the drop was 33% to 1.4 million tons, and at Pretoria, the drop was 46% to 0.8 million tons. Similarly, total liquid steel output decreased 21.5% to 5.6 million tons; of which, the decrease at Vanderbijlpark was down 12% to 3.5 million tons, Newcastle dropped 26% to 1.4 million tons, and Pretoria was down 45% to 0.7 million tons.

Lead, Silver, and Zinc.—The Black Mountain Mineral Development Co., jointly owned by GFSA and Phelps Dodge, was the only major producer of primary lead and silver from its mining complex near Aggeneys in northwestern Cape Province. Despite continued low prices for lead and silver, the company's 1983 profit of $900,000 was an increase over that for 1982. The 1.2 million tons of ore milled yielded 81,067 tons of lead in argentiferous galena concentrate, which, along with argentiferous copper concentrate, was hauled by rail to Saldanha Bay for export. The 20,461 tons of zinc in argentiferous sphalerite concentrate was railed to GFSA's Zinc Corp. of South Africa Ltd.'s (Zincor) refinery at Springs, east of Johannesburg. The silver content of the three Black Mountain concentrates totaled 3,343,677 troy ounces. Black Mountain's sales revenue was $46 million, a drop of 34% below 1982 revenue, and the net profit of $900,000 was only 6% of that reported for 1982. At yearend 1983, the Black Mountain ore reserves included 37 million tons of complex sulfite ore containing 6% lead, 2.9% zinc, 0.4% copper, and 2.1 troy ounces of silver per ton. Two other deposits of similar mineralization were present on the Black Mountain property. The Rand Refinery recovered nearly 2.2 million troy ounces from gold bullion, and more than 300,000 troy ounces of silver was recovered from copper refining.

The Pruska copper-zinc-pyrite mine at Copperton, 65 kilometers southwest of Pruska in north-central Cape Province, produced nearly 70,000 tons of zinc metal in concentrate, which was shipped to Zincor's plant at Springs for refining. The capacity of Zincor's primary zinc smelter was increased by 24% to meet domestic requirements including handling of the zinc concentrate from Iscor's Rosh Pinah Mine in Namibia. Zincor's total output increased slightly to 84,384 tons of refined zinc. Smelting operations were reduced because of the declining demand for sulfuric acid. Net profits dropped 44% below that of 1982 to $3.6 million.

Manganese.—The delayed effects of the depressed world steel industry was most strongly felt by the Republic of South Africa's manganese producers. Manganese ore production was down 45% to 2.9 million tons, the value of manganese ore exports dropped 38% to $77 million, and the value of domestic sales decreased 58% to $22 million. By yearend, many of the country's manganese producers had closed; among them was South African Manganese Amcor Ltd. and Associated Manganese Mines of

South Africa Ltd., which had decreased costs by closing its facility.

Nickel and Platinum-Group Metals.—The Republic of South Africa produced 40% of the world's platinum and substantial proportions of palladium, rhodium, and the other platinum-group metals from a number of mines operated by three companies along the Merensky Reef of the Bushveld Igneous Complex. Rustenburg Platinum Mines Ltd. operated four mines to supply its associated Matthey Rustenburg Refiners (Pty.) Ltd. plant at Wadesville and the new base metal refinery operated by the affiliated Matthey Nickel Ltd. Rustenburg's capacity was 1.3 million troy ounces of platinum-group metals, 18,000 tons of nickel, 12,000 tons of copper, and 200 tons of cobalt salts. Its production of platinum-group metals was 850,000 troy ounces. Portions of the four mines were in the Bophuthatswana Homeland, and all of its properties were owned by Rustenburg Platinum Holdings Ltd., which was managed and 32.9% owned by JCI, with AAC owning 23.8% and GFSA about 20%. The country's second largest producer, Impala Platinum Holdings (Pty.) Ltd., had the capacity to produce about 1 million troy ounces of platinum-group metals. Most of its mines, concentrators, and smelters were within the Bophuthatswana Homeland, but the refinery was at Springs, east of Johannesburg in Transvaal Province. Impala's operations were managed and 44% owned by Gencor.

Western Platinum Ltd. (Wesplat), managed by Lonrho Ltd. and partly owned by Falconbridge Ltd., operated its concentrator on platinum-nickel ore from the Merensky but commenced to mine and process platinum-chromite ores from the UG2 Chromatite Reef. An experimental plasma technique was developed to handle the platinum-chromite concentrate. Platinum capacity was doubled to 120,000 troy ounces in 1983. Wesplat's matte had been shipped to Falconbridge's Norway refinery where the base metals were refined and the precious metal residue returned to the Republic of South Africa. Wesplat was considering an alternative recovery method for a new matte treatment plant within the country. GFSA was considering opening a new platinum mine on the UG2 Chromatite Reef near the Amandebult Section of Rustenburg. The proposed plant was to have an annual capacity of 250,000 troy ounces of platinum and 100,000 troy ounces of palladium, plus other metals extracted from 2.4 million tons of ore per year.

Tin.—Output of tin concentrate was 12% lower than that of 1982, and local sales were down 38% in both volume and value. Export sales increased nearly 7% in volume and nearly 9% in value. Most of the tin production came from GFSA's Rooiberg Tin Ltd. plant, which had an output of 2,355 tons of cassiterite concentrate containing 2,000 tons of tin metal. GFSA's Rooiberg Mine produced 2,355 tons of tin, slightly lower than the 1982 output. Revenue increased marginally to nearly $27 million while costs increased nearly 15% to almost $18 million. Taxes declined 27% to $2.7 million, leaving a net profit of $7.2 million, 17% lower than that of 1982. GFSA's fading Union Tin Mines Ltd. continued to maintain a small production by retreatment of old tailings. The ore grade at GFSA's Union Tin continued to decline and production dropped to 350 tons of tin in concentrates yielding a net profit of nearly $100,000, about 12% of the 1982 figure. AAC's Zaaiplaats Tin Mining Co. Ltd. completed rejuvenation of its surface plant to a capacity for treating 7,500 tons of ore per month. Additional underground and surface development and exploration was aimed at increasing the availability of sufficient ore to maintain mill and smelter throughputs. A Government program of augur drilling in the vicinity indicated the absence of alluvial cassiterite in the sand flats near Zaaiplaats.

Titanium, Vanadium, and Zirconium.—Tisand (Pty.) Ltd., a subsidiary of Quebec Iron and Titanium Ltd. (QIT) of Canada, managed dredging operations in a self-made lagoon in beach sand dunes along the shore north from Richards Bay. Ilmenite, rutile, zircon, and monazite were the chief heavy minerals recovered from preliminary washing operations aboard the dredges. The concentrate was pumped ashore and separated into the four chief constituents by electrostatic and electromagnetic equipment. Another subsidiary of QIT, Richards Bay Iron and Titanium Ltd. (RBIT), smelted the ilmenite fraction in an electric furnace to produce about 390,000 tons of 85% titanium dioxide slag and 390,000 tons of low-manganese pig iron. RBIT also purified and packaged approximately 45,000 tons of rutile, 100,000 tons of zircon, and 30,000 tons of rare-earth-bearing monazite for the export market. The 100% zircon dioxide mined as baddeleyite commanded a higher unit price than the zircon concentrate and about 6,000 tons was produced by PMC and its neighbor, IDC's Phosphate Development Corp. Ltd.

Most of the country's vanadium production came from AAC's subsidiary, Highveld Steel and Vanadium Corp. Ltd., from the Mapoch Mine in the Bushveld Igneous Complex northeast of Pretoria, exploiting the world's largest deposit of vanadiferous, titaniferous magnesite.

The Mapoch Mine produced 1.47 million tons of magnetite ore and the submerged arc smelting furnaces produced 35,825 tons of vanadium-rich slag, and 548,810 tons of steel subsequently fabricated into sections, plates, and coils. The vanadium output was approximately 55% of the world's production.

NONMETALS

Andalusite and Related Minerals.—Prolonged drought was a major cause of additional decline in the country's output of andalusite and sillimanite of 25% and 92%, respectively. The country maintained its position as the world's leading producer of andalusite and exported 55% of its production. Domestic consumption was chiefly by AAC's Vereeniging Refractories Ltd. Andalusite deposits occur in the metamorphosed contact zone around the Bushveld Igneous Complex and are generally recovered by washing the clay from eluvial concentrations in Transvaal Province and in some of the neighboring homelands. Many of the larger deposits were operated by one of several mines operated by Cullinan Minerals (Pty.) Ltd. of Lydenburg; by subsidiaries of ACC and BRL companies; or by Weedon's Minerals (Pty.) Ltd. from its Timeball andalusite mine near Thabazimbi. Sillimanite was recovered from a number of deposits of nearly pure sillimanite rock mined by Pella Refractory Ores S.A. (Pty.) Ltd. and by R. G. Niemoller (Pty.) Ltd. near Pofadder in northwestern Cape Province.

Asbestos.—Gencor's subsidiary, Griqualand Exploration and Finance Co. Ltd. (Gefco), controlled virtually all of the country's output of crocidolite and amosite asbestos, and Gencor was 40% owner and manager of the Msauli Mine near the Swaziland border, which produced chrysotile asbestos. Total asbestos output increased 4% but was still far below the production levels enjoyed in the early 1970's before adverse publicity about the carcinogenic effects of microscopic asbestos particles caused the banning of the mineral in most insulating applications and to restrictive legislation in several Western industrial nations. The value of export sales increased 8.6% to $96 million. The development of two tertiary shafts opened up deeper ore at Msauli, which allowed a 10% increase in chrysotile production. Msauli also continued surface exploration in the vicinity for additional ore. Gencor's Cape Blue crocidolite production in the Kuraman area declined 20% when several mines were closed, and the work force was reduced by 12% to a total staff of 7,400. Gencor was engaged in an educational marketing campaign to demonstrate how the long spinning fiber grades can be worked and used without producing the extremely fine particles that are the real hazard to health. Production of the chemically resistant amosite asbestos from Gencor's Egnep Mine near Penge, 170 kilometers northwest of Swaziland, also declined by 20%.

Cement, Lime, and Limestone.—Production of limestone declined 11% to under 20 million tons, from which 1 million tons of burnt lime products and 8 million tons of cement were manufactured. BRL's subsidiary, Pretoria Portland Cement Ltd. (PPC), accounted for more than one-half of the country's raw limestone, nearly one-half of its cement, and 65% of its lime. PPC operated limestone quarries at Loerie near Port Elizabeth, at Pienaars River, and at Beestekraal, north and northwest of Pretoria, respectively. At Lime Acres northwest of Kimberley and at Marble Hall northeast of Pretoria, PPC operated large quarries and lime kilns. Its De Hoek and Riebeeck West cement factories are north of Cape Town. Another is at Port Elizabeth. The Jupiter and Hercules cement factories of PPC are near Johannesburg and Pretoria, respectively, and a factory named "Slurry" is located east of the railroad junction at Mafeking. Gypsum was quarried at Windsorton Road north of Kimberley, at Copperton southwest of Prieska, and at Baroe south of Bloemfontein. Anglo-Alpha Ltd., 48% owned by Swiss interests and managed by AVL, had two cement factories in western Transvaal Province and another near Kimberley in Cape Province. The 55% British-owned Blue Circle Cement Co. Ltd. operated two limestone quarries and cement factories in Orange Free State Province. All three companies shared in the ownership of the new 500,000-ton-per-year cement clinker factory at Simana near Port Shipstone and in the Slagment factory near Durban.

Diamond.—Production of natural diamonds was 12.6% greater than in 1982, and the volume of export sales increased 33% including nearly 1 million carats from De Beers diamond stocks. The dollar value of export sales increased 50% over that of 1982, owing in part to a 12.5% increase in the average price to $41.85 per carat. By yearend, the value of De Beers' remaining stocks had increased by $163 million to $1,852.3 million and profits had increased 16% to $476.7 million, partly the result of unusually good holiday sales in the United States. Total output from De Beers' South African Mines increased nearly 10% to 9,655,605 carats of diamonds, which comprised nearly 94% of the country's total output. The largest producer continued to be the Finsch Mine, 150 kilometers northwest of Kimberley in Cape Province, where diamond output increased more than 30% to 5,042,705 carats. Kimberlite ore production, at 5.019 million tons, was nearly 20% greater than in 1982; the ore grade of slightly more than 1 carat per ton was 10% higher than in 1982. All ore was mined between the 184- and 256-meter levels of the open pit. Development in preparation for underground mining of the Finsch Kimberlite pipe included access to the pipe from the main shaft between the 59 and 68 levels (the level number multiplied by 10 is its depth in meters) and preparation of a site for an underground crushing station. An east ventilation shaft was completed as was a crosscut to the main shaft at the 29 level. The north spiral ramp reached the 40 level with access completed to the pipe between the 29 and 37 levels.

Table 6.—Republic of South Africa: Marketed diamond output, by Province

Province	1981 Output (carats)	1981 Price per carat	1982[r] Output (carats)	1982[r] Price per carat	1983[p] Output (carats)	1983[p] Price per carat
Mine diamond:						
Transvaal	1,871,107	$28.08	2,251,169	$18.54	2,673,249	$22.37
Cape Province	4,693,074	27.12	4,756,484	21.98	6,184,238	27.54
Orange Free State	353,082	98.07	219,098	92.37	99,188	74.21
Total or average	6,917,263	31.00	7,226,751	23.04	8,956,675	26.51
Alluvial diamond:						
Transvaal	23,902	282.00	26,690	187.62	36,353	200.79
Cape Province	1,171,100	144.59	1,225,356	117.25	1,316,729	156.55
Orange Free State	127	544.64	321	372.37	602	48.66
Total or average	1,195,129	147.38	1,252,367	118.75	1,353,684	157.69
Grand total or average	8,112,392	48.14	8,479,118	37.18	10,310,359	43.74

[p] Preliminary. [r] Revised.

Sources: Republic of South Africa Department of Mineral and Energy Affairs. Quarterly Information Circular, Minerals, Oct.-Dec. 1981-82, p. 6, and Monthly Commodity Summaries for 1983. R1=US$1.149 for 1981, R1=US$0.9228 for 1982, and R1=US$0.8991 for 1983.

The Kimberley Pool Mines included several underground operations on Kimberlite pipes originally worked from the surface in the vicinity of Kimberley in northeastern Cape Province. Total production from the Kimberley Pool was 1,085,242 carats of diamonds, 10% less than in 1982 because of a 12% drop in the ore grade to 24.04 carats per 100 tons and despite a slight increase in ore output. The old De Beers Mine produced 127,235 carats of diamonds from 647,000 tons of ore at a grade of 19.6 carats per 100 tons. More than 60% of the ore came from the 620-meter-level sublevel cave and the east core remnant, and nearly 40% from the 745-meter-level block cave area. At the Duboitspan Mine, 612,000 tons of ore from the 760-meter-level block cave contained 17.32 carats per 100 tons and yielded 105,940 carats of diamonds. Drainage of water from the surrounding strata continued, but minor mud advances were noted in abandoned workings on the 575-meter level. The Bultfontein operations recovered 244,181 carats of diamonds from 671,000 tons of 36.36-carat-per-100-ton ore from the underground mine, and 330,388 carats of diamonds from 1.18 million tons of 28-carat-per-100-ton ore from the old Bultfontein Floors dump; more than 50% of the underground ore came from the 700-meter-level block cave and rim loading sections. Crushed drawpoints were rehabilitated in the southeast section of the 700-meter level, and plans for sublevel development below the 700-meter level were completed.

At the Wesselton Mine, a drop of nearly 13% below the ore grade in 1982 was responsible for the output of 277,498 carats of diamonds from 1.404 million tons of ore containing 19.76 carats per 100 tons. Nearly 60% of the ore came from the remnant mining section where additional ore reserves were located by diamond drilling. The remainder of the ore was from the 785-meter-level block cave area where little ore remains. An additional ventilation pass was excavated, and remnant blocks were established on the 615- and 625-meter levels where pillar extraction operations were planned. At the Kimberley Mine, monitoring of the drainage tunnel to detect movement in the walls of the "Big Hole" was continued. The Koffiefontein Mine in the Orange Free State, 80 kilometers south of Kimberley, remained on a care-and-maintenance basis, but the water level in the nearby Kalkfontein storage dam had risen slightly after the prolonged drought was broken by rains.

Recovery of diamonds of De Beers Premier Mine, 40 kilometers east of Pretoria in Transvaal Province, increased 7% owing to a combination of higher grade underground ore and the treatment of 32% more fine dump material than in 1982. Output of underground ore was delayed by the collapse of doleritic rock from the barren sill into an ore slot. Capital expenditure on development below the sill was held to the minimum required for continued operation of the mine. Underground ore output totaled 5.484 million tons at a grade of 36.56 carats per 100 tons and yielded 2,000,818 carats of diamonds. In addition, 1.585 million tons of fine-grain dump material containing 40.35 carats per 100 tons was treated to yield 639,580 carats of diamonds, an increase of nearly 6% more than 1982 output. Premier's accident frequency rate had been reduced 67% since 1979 to 3.4 accidents per million worker hours.

Production of beach terrace alluvial diamonds from the Namaqualand areas along the northwest coast of the country declined 7% below the output of 1982. The overall grade of Namaqualand ore or "terrace" gravels declined 18% to 17.46 carats per 100 tons, but the quantity of material treated increased 13% to 5.058 million tons. Overburden stripping at the Namaqualand mines increased 6% to 14.363 million tons. The Tweepad plant and the bulk sampling plant at Dreyers Pan had a combined output of 220,629 carats of diamonds from 3.380 million tons of terrace at a grade of 6.53 carats per 100 tons. The Dreyers Pan plant was on single-shift operation, and the Annex Kleinzee plant remained closed through the year. The Koingnass treatment plant handled 174,000 tons of washed gravel from Mitchells Bay and 1.352 million tons 41.52-carat-per-100-ton ore from the Koingnass open pit mine to recover 633,656 carats of diamonds. Operations at the Langhoogte Mine were reduced from double to single shift, and diamond output dropped 35% to 28,975 carats from 152,000 tons of ore at a grade of 19.06 carats per 100 tons.

Fluorspar.—Production of fluorspar declined 19% to nearly 268,000 tons, but the country maintained its position as the second largest producer among market economy countries. The volume of export sales increased nearly 6% to 246,462 tons to satisfy the growing demand from aluminum and fluorocarbon industries overseas. Iscor was the largest consumer of the 36,000 tons of fluorspar sold locally, but most of the production, nearly 250,000 tons worth $25 million, was exported, chiefly to the United States. Phelps Dodge produced 45,000 tons of acid-grade fluorspar from the small Rheunosterfontein fluorspar mine near Zeerust. Gencor's Buffalo Mine near the center of the Bushveld Igneous Complex was the country's largest producer with a capacity of 240,000 tons per year. BRL's 180,000-ton-per-year Marico Fluorspar (Pty.) Ltd. and the 115,000-ton-per-year Vergenoeg Mining Co. (Pty.) Ltd., affiliated with Bayer AG of the Federal Republic of Germany, both operated well below rated capacity.

Phosphate Rock.—IDC's Foskor Mine and mill at the PMC carbonatite deposit accounted for virtually all the 2.9 million tons and 30% P_2O_5 apatite concentrate extracted from its own ores and from tailings pumped from the nearby PMC copper mine. Concentrate production was up slightly, but local sales were down 26% to less than 2 million tons, which were purchased by Federale Kunsmis Ltd., Triomf Fertilizer (Pty.) Ltd., and others. Export sales volume more than doubled to 251,214 tons. Local demand for all types of fertilizers slumped when large areas of farmland remained uncultivated because of the prolonged drought, the worst since the 1930's.

MINERAL FUELS

Coal.—Despite the worldwide depressed state of the steel and most base metal industries, there was continued demand for coal in both the domestic and export markets although dollar values declined slightly. Total coal production increased 4% to a record high 145.8 million tons including an increase of nearly 5% in bituminous coal to 143.5 million tons. Anthracite output declined 28% to 2.4 million tons. Local sales of bituminous coal increased nearly 6% in volume to more than 112 million tons; export sales rose nearly 10% to more than 28 million tons. The dollar value of local sales was down 2.8% and that of export sales was nearly 7% below the 1982 value. Local sales of anthracite decreased 6% by volume and 21% in value, but more than 67% of the anthracite was exported with a drop in volume of 17% to 1.6 million tons and a 27% drop in value to $56.75 million. Domestic sales of coal for electricity generation were lower because of a depressed economy and weakened industrial activity. There was also a drop in sales of metallurgical coal to local industries. The amount of coal consumed for synfuels, plastics, and chemicals by the Sasol complex increased substantially. Seven high-cost collieries closed during the year, but the AAC's Goudehoop, BRL's Middleburg, and the Optimum Collieries substantially increased their output for the export market, while BRL's Purha and the Government-operated Electricity Supply Commission's Matla Collieries expanded their output to the power stations.

The Sasol oil-from-coal organization reported a group turnover of $1,350 billion for the fiscal year ended June 25, 1983. The pretax profit was nearly $350 million, and net profit was nearly $209 million. Coal production at Sasolburg's Sigma Colliery was 5.7 million tons, a slight increase over that of 1982. At the Secunda Colliery, including four mine units, coal production nearly doubled to 22.2 million tons, setting several production records in the process.

Petroleum.—Offshore drilling by the state-owned Southern Oil Exploration Corp. (Pty.) Ltd. (Soekor) continued to explore oil shows off the south coast of the country. Fourteen offshore test wells were completed; meters drilled totaled 45,780.

The results of testing four of the holes are as follows:

1. Hole E-G 3, 138 kilometers southeast of Mossel Bay, had an inferred maximum gas flow rate of less than 42,500 cubic meters of gas per day from 8 meters of the 44 meters of pay formation tested.
2. Hole E-S1, 83 kilometers south-southwest of Mossel Bay, tested two zones having a total of 80 meters of permeable sandstone, which produced 856 barrels of condensate and 1.63 million cubic meters of gas. This was the best "show" to yearend, but offsetting holes drilled 1 and 2 kilometers nearer the bay failed to intersect the gas-bearing sandstone.
3. Hole Ga-Q1, 70 kilometers south-southeast of Plettenburg Bay, flowed at a maximum rate of 320,000 cubic meters of gas and 5 barrels of oil per day from a total of 11 feet of permeable sandstone.
4. Hole F-A10, 87 kilometers south of Mossel Bay, had a maximum flow rate of 580,000 cubic meters of gas with 564 barrels of light oil per day.

Four other holes were drilled in the Mossel Bay area; one was 75 kilometers east-southeast of Plettenburg Bay, and another was 37 kilometers southwest of Port Elizabeth, while two were northeast of Durban, one each at 28 and 80 kilometers. In addition, Soekor sublessees drilled 11 onshore tests to evaluate oil shows in Karro sandstones, with indifferent results. Soekor's total expenses for the year equaled $74.3 million.

Uranium.—Production of uranium oxide (U_3O_8) concentrate increased about 4% to 7,128 tons in 1983, and spot prices increased gradually throughout the year. Increased production was reported from the Beisa Section of the St. Helena Mine, but U_3O_8 output from BRL's Blyvooruitzicht and Harmony Mines declined. Surface exploration for uranium deposits, particularly in the Karroo formations, was disappointing, and had virtually ceased.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from South African rands (R) to U.S. dollars at the rate of R1 = US$0.9228 for 1982 and R1 = US$0.8991 for 1983.

[3] International Financial Statistics. V. 37, No. 7, July 1984, p. 404, line 99b.

Table 7.—Republic of South Africa: Production of U_3O_8, by producer

(Kilograms)

Producer	1979	1980	1981	1982	1983[p]
AAC's Joint Metallurgical Scheme[1]	676,262	977,116	1,093,416	863,361	718,928
Blyvooruitzicht	285,710	324,482	315,502	252,270	289,156
Buffelsfontein	620,400	603,800	631,750	580,500	611,000
East Rand Gold and Uranium Co. Ltd. (Ergo)	238,734	295,314	302,194	264,814	229,885
Harmony	540,925	490,822	580,428	591,090	623,600
Hartebeestfontein	394,210	435,242	478,663	429,103	441,446
Palabora Copper	121,252	140,000	234,206	257,879	218,635
Randfontein	412,959	646,452	591,774	462,837	491,067
St. Helena-Beisa	--	--	--	253,612	454,792
Vaal Reefs	1,273,415	1,758,386	1,693,569	1,721,782	1,877,421
West Driefontein	288,274	251,656	242,327	224,601	174,566
West Rand Consolidated	367,512	385,924	190,258	--	--
Western Areas	--	--	--	170,638	282,465
Western Deep Levels	199,002	212,562	212,484	183,394	173,841
Miscellaneous	218,345	773,619	[r]668,320	[r]577,176	541,190
Total	5,637,000	7,295,375	[r]7,234,891	[r]6,833,057	7,127,992

[p] Preliminary. [r] Revised.

[1] Includes recovery of U_3O_8 from concentrates and tailings produced by the Free State Geduld, Free State Saaiplaas, President Brand, President Steyn, Welkom, and Western Holdings mines, all subsidiaries of Anglo American Corp. Ltd. in the Orange Free State Province.

Sources: Chamber of Mines of South Africa. Quarterly Analysis of Working Results, Oct.-Dec. 1979-83; Republic of South Africa, Department of Mineral and Energy Affairs. Quarterly Statistical and Other Data on Minerals, Oct.-Dec. 1979-82; Republic of South Africa, Department of Mineral and Energy Affairs. Annual Reports 1980-83; Palabora Mining Co. Ltd. Annual Reports 1979-83; and East Rand Gold and Uranium Co. Ltd. Annual and Quarterly Reports, 1979-83.

The Mineral Industry of Spain

By Roman V. Sondermayer[1]

During 1983, Spain remained an important producer of minerals and metals and a significant processor of imported bauxite and crude petroleum in Europe. The more prominent minerals, with production expressed as approximate percentages of world output, were as follows: strontium, 30%; mercury, 25%; pyrite, 10%; gypsum, 6%; magnesite, 5%; smelter zinc, 3%; mine zinc, 3%; refined lead, 2%; potash, 2%; mine lead, 2%; and refined copper, 1.6%. Production of other minerals and fuels was only of domestic importance. Value of production of the mineral industry of Spain, including processing, was equal to about 10% of the value of the gross national product; however, the share of the extractive industry was approximately 1%. The industry, including mining and processing, employed about 610,000 persons.

The new Government, elected in 1982, accepted the Plan Nacional de Abastecimiento de Materias Primas y Minerales (PNAMP) (National Minerals and Raw Materials Supply Plan) as it was prepared by the previous administration. However, this plan will be revised every 3 years, and in revisions, the local governments will be involved. In addition, the Government has revised the energy plan, which is known as Plan Energético National III (National Energy Plan-Third Version). Emphasis was on

Table 1.—Spain: Principal mineral industry companies and locations, by commodity

Commodity	Major companies	Location of principal facilities
Alumina	Alúmina de España S.A	Plant at San Ciprián.
Aluminum	Alúminio Español S.A	Do.
Do	Endasa S.A	Plant at Avilés and Valladolid.
Do	Alúminio de Galicia S.A	Plant at La Coruña and Sabiñánigo.
Bituminous coal	Hunosa S.A	Mines in Astúrias.
Cement	Asland S.A	7 plants at various locations.
Copper ore	Río Tinto Minero S.A	Mines at Río Tinto.
Copper, refined	do	Refinery at Huelva.
Ferroalloys	Soc. Española de Carburos Metálicos S.A.	Plant at Berga.
	Hidro Nitro Españolas S.A	Plant at Monzón.
	Ferroaleaciones Españolas S.A	Plant at Medina del Campo.
Iron ore	Cía. Andalusa de Minas S.A	Mine at Marquesado.
Lead ores	Sociedad Minera y Metallúrgica de Peñarroya de España.	Mines at Mantas de los Azules and Unión.
Lead smelter	do	Smelter at Santa Lucía.
Mercury	Consejo de Administración de Minas de Almadén.	Mines and smelter at Almadén.
Petroleum, refined	Empresa Nacional del Petróleo S.A	Refineries at Valle de Escombreras, Puertollano, and Tarragona.
Do	Cía. Española de Petróleos S.A	Refineries at St. Cruz de Tenerife and Algeciras.
Potash	Potasas de Navarra S.A	Mine near Pamplona.
Do	Minas de Potasas de Suria S.A	Mine near Suria.
Do	Unión Explosivos Río Tinto S.A	Mines at Balsarney-Sallent and Cardona.
Pyrites	Tharsis Sulfur and Copper Co. Ltd	Mines at Tharsis and La Zarza.
Steel	Empresa Nacional Siderúrgica S.A	Works at Avilés, Felguera, Gijón-Moreda, and Gijón-Verina.
Do	Altos Hornos de Vizcaya S.A	Work at Baracaldo-Sestao.
Zinc ore	Real Cía. Asturiana de Minas S.A	Mines at Reocín and Rubiales.
Zinc, smelter	do	Electrolytic zinc plant at San Juan de Nieva.

coal, and the nuclear sector was cut.

The general economic situation was characterized by unemployment averaging 17% and by an increase in the cost of living of about 12%.

The major events in the mineral industry included, among others: startup of a new mine at Sotiel that produced complex sulfide ores of lead, zinc, and copper; beginning of construction of an iron ore pelletizing plant in Badajoz Province; reopening of the Aznalcóllar copper-lead-zinc mine in southern Spain; discovery of a tungsten deposit in Salamanca Province; and the start of production at a natural sodium sulfate mine south of Madrid.

Table 2.—Spain: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum:					
Bauxite	16,845	7,899	8,930	7,361	7,500
Alumina	--	58,000	695,000	672,000	650,000
Metal:					
Primary	259,511	386,492	396,600	366,500	[2]357,614
Secondary	42,000	43,000	40,000	[e]35,000	30,000
Antimony, mine output, metal content	501	625	646	459	500
Cadmium metal	222	309	310	[e]300	280
Copper:					
Mine output, metal content	31,324	42,483	50,923	47,614	[2]49,964
Metal:					
Blister:					
Primary	90,300	85,100	87,900	105,000	110,000
Secondary	18,000	18,000	20,000	30,000	30,000
Total	108,300	103,100	107,900	135,000	140,000
Refined:					
Primary	126,100	138,700	137,100	151,300	143,600
Secondary	[r]14,300	15,000	15,000	20,600	15,000
Total	[r]140,400	[r]153,700	152,100	171,900	158,600
Gold, mine output, metal content troy ounces	91,404	108,154	98,381	108,508	110,000
Iron and steel:					
Iron ore and concentrate (including byproduct concentrate):					
Gross weight thousand tons	8,827	9,227	8,565	8,370	[2]7,449
Iron content do	3,994	4,372	4,218	4,130	[2]3,512
Metal:					
Pig iron do	6,454	6,720	6,423	5,991	5,398
Electric-furnace ferroalloys do	421	383	293	259	253
Steel:					
Crude do	12,058	12,333	12,662	13,160	12,731
Castings and forgings do	246	253	250	NA	NA
Total do	12,304	12,586	12,912	NA	NA
Semimanufactures do	9,202	9,472	NA	NA	NA
Lead:					
Mine output, metal content	72,262	87,105	80,200	73,271	[2]82,453
Metal:					
Primary	87,200	84,300	83,000	99,500	100,000
Secondary	39,800	39,700	34,100	32,100	30,000
Mercury:					
Mine output, metal content 76-pound flasks	33,275	49,198	49,545	150,374	150,000
Metal do	32,375	43,038	46,008	48,808	48,000
Silver, mine output, metal content thousand troy ounces	[r]3,160	4,526	5,347	3,787	4,000
Tantalum minerals (tin byproduct):					
Gross weight kilograms	34,400	[r]50,730	58,390	53,630	54,000
Tantalum content do	[r]8,620	[r]13,445	16,463	14,142	14,000
Tin:					
Mine output, metal content	496	437	475	563	[2]395
Metal, primary	4,412	4,100	3,400	3,700	2,200
Titanium dioxide[e]	40,000	40,000	40,000	40,000	35,000
Tungsten, mine output, metal content	394	446	437	545	[2]450
Uranium, mine output, U_3O_8 content	349	394	290	280	[2]283
Zinc:					
Mine output, metal content	142,745	183,120	182,045	167,000	[2]167,715
Metal, primary and secondary	182,700	151,800	179,500	187,000	190,000
NONMETALS					
Barite	74,700	59,827	52,695	50,031	50,000
Bromine[e]	400	400	400	350	330

See footnotes at end of table.

Table 2.—Spain: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Cement, hydraulic, other than natural thousand tons	27,912	28,010	28,751	29,569	[2]30,632
Clays:					
Attapulgite	62,423	48,020	42,227	42,926	43,000
Bentonite	120,678	97,705	110,000	112,326	110,000
Kaolin, marketable:					
Crude	72,425	46,066	71,665	72,956	73,000
Washed	204,106	181,116	189,990	165,936	160,000
Refractory, not further described	427,817	416,114	529,416	453,425	450,000
Other thousand cubic meters	8,590	7,838	10,994	11,318	11,000
Diatomite and tripoli	27,196	23,460	38,111	63,365	65,000
Feldspar	115,685	103,365	129,593	131,071	125,000
Fluorspar:					
Gross weight:					
Acid-grade	155,278	204,596	213,616	157,205	[2]190,819
Metallurgical-grade	37,620	40,153	43,511	37,075	[2]41,461
Total	192,898	244,749	257,127	194,280	[2]232,280
CaF_2 content:					
Acid-grade	150,327	198,152	259,500	197,550	[2]185,403
Metallurgical-grade	28,600	29,631	31,500	29,247	[2]33,322
Total	178,927	227,783	291,000	226,797	[2]218,725
Gypsum and anhydrite, crude thousand tons	5,275	5,223	5,288	5,048	5,000
Kyanite, andalusite and related materials	5,355	6,471	6,151	5,105	5,000
Lime, hydrate and quicklime thousand tons	701	950	1,051	1,100	1,000
Magnesite:					
Calcined	147,761	153,933	135,023	154,421	150,000
Crude	381,867	505,532	476,392	533,595	540,000
Mica	5,169	4,831	3,524	3,428	3,400
Nitrogen: N content of ammonia thousand tons	[r]827	[r]742	743	538	550
Pigments, mineral:					
Ocher	15,078	13,696	15,522	11,709	10,000
Red iron oxide[e]	25,000	25,000	25,000	23,000	20,000
Potash salts, K_2O equivalent	667,560	658,230	731,642	691,931	657,000
Pumice	779,118	1,086,417	937,851	970,480	980,000
Pyrite including cuprous, gross weight thousand tons	2,366	2,394	2,400	[e]2,200	[2]2,291
Salt:					
Rock including byproduct from potash works do.	2,187	2,379	2,300	2,213	2,200
Marine and other do.	1,261	1,129	1,393	1,077	1,100
Sand and gravel: Silica sand[3] do.	2,178	2,425	1,832	1,611	1,600
Sepiolite	202,810	286,232	288,499	329,243	330,000
Sodium compounds:					
Sodium carbonate, manufactured[e] thousand tons	500	505	500	500	500
Sodium sulfate:					
Natural:					
Glauberite, Na_2SO_4 content	101,780	37,735	55,097	92,737	92,000
Thenardite, Na_2SO_4 content	106,022	118,324	132,340	117,776	118,000
Manufactured	175,000	175,000	175,000	170,000	170,000
Stone:					
Calcareous:					
Chalk thousand tons	282	278	277	397	NA
Dolomite do.	1,909	2,043	1,999	1,967	NA
Limestone do.	85,379	81,239	78,673	83,831	NA
Marble do.	823	753	694	665	NA
Marl do.	7,708	7,150	6,210	6,380	NA
Basalt do.	1,434	920	1,138	1,269	NA
Granite do.	6,794	7,224	7,514	7,671	NA
Ofite do.	1,169	458	659	846	NA
Phonolite do.	466	396	568	680	NA
Porphyry do.	462	396	341	309	NA
Quartz do.	790	708	627	455	NA
Quartzite do.	448	401	347	432	NA
Sandstone do.	1,265	1,633	1,791	1,807	NA
Serpentine do.	409	302	342	303	NA
Other do.	29,855	29,890	26,819	25,308	NA
Strontium minerals:					
Gross weight	18,000	19,000	36,000	34,900	35,000
Sr_2O_4 content	16,560	17,480	33,120	32,108	32,000

See footnotes at end of table.

Table 2.—Spain: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Sulfur:					
S content of pyrites thousand tons	1,091	1,096	1,118	1,029	1,100
Byproduct:					
Of metallurgy do.	120	125	135	130	125
Of petroleum do.	10	12	12	10	9
Of coal (lignite) gasification do.	3	3	3	3	3
Total do.	1,224	1,236	1,268	1,172	1,237
Talc and steatite	71,047	73,949	69,068	69,686	64,000
MINERAL FUELS AND RELATED MATERIALS					
Coal (marketable):					
Anthracite thousand tons	3,796	4,077	4,863	5,205	[2]5,574
Bituminous do.	8,049	9,070	9,080	10,217	[2]10,240
Lignite do.	10,696	15,390	20,986	23,882	[2]24,088
Total do.	22,541	28,537	34,929	39,304	[2]39,902
Coke, metallurgical do.	3,897	4,000	NA	NA	3,422
Gas, natural: Marketed million cubic feet	363	300	NA	NA	NA
Peat	46,379	44,367	39,012	60,092	60,000
Petroleum:					
Crude thousand 42-gallon barrels	8,383	11,732	8,955	11,170	21,693
Refinery products:					
Liquefied petroleum gases do.	(4)	(4)	11,228	10,834	12,597
Naphtha do.	(4)	(4)	9,891	12,138	18,606
Gasoline, motor do.	46,844	45,452	44,871	38,505	47,787
Jet fuel do.	17,928	17,091	15,720	15,816	16,968
Kerosine do.	473	1,061	581	3,231	1,418
Distillate fuel oil do.	83,272	80,219	78,270	75,055	74,771
Residual fuel oil do.	139,663	151,365	148,371	123,762	108,391
Lubricants including grease do.	1,657	2,386	(4)	(4)	(4)
Other do.	[e]44,000	47,346	41,552	49,896	45,927
Refinery fuel and losses do.	[e]21,000	21,700	6,391	8,108	10,405
Total do.	354,837	366,620	356,875	337,345	336,870

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through Aug. 2, 1984.

[2] Reported figure.

[3] Includes sand obtained as a byproduct of feldspar and kaolin production.

[4] Included in other refinery products.

TRADE

During 1982, the latest year for which complete data were available, Spain had a negative trade balance of about $8.6 billion and a deficit in minerals trade of about $5.4 billion; imported fuels were a significant component of the overall negative balance.

The value of imports of minerals was about 50% of the total value of country imports. Fuel, the most valued import, shared 39% of the value of the country's total imports and 79% of the value of mineral imports.

The value of exports of minerals was 30% of the total value of Spain's exports; exports of metals topped the list of values of exported mineral commodities and shared 15% in the total country exports and 51% in mineral exports.

Table 3.—Spain: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	1,449	1,486	--	Portugal 1,461; Tunisia 25.
Oxides and hydroxides	23,907	7,377	--	United Kingdom 7,312.
Metal including alloys:				
Scrap	101	3	--	All to Peru.
Unwrought	162,682	145,217	--	Netherlands 46,235; Japan 26,982; Portugal 20,510.
Semimanufactures	18,834	18,182	851	France 2,964; Japan 2,954.
Antimony: Metal including alloys, all forms	568	506	49	Netherlands 157; Egypt 122.
Arsenic: Oxides and acids	276	10	--	Belgium-Luxembourg 5.
Cadmium: Metal including alloys, all forms	204	209	40	Netherlands 160.
Chromium: Ore and concentrate	41	8	--	Tunisia 5; Portugal 3.
Cobalt: Metal including alloys, all forms	3	36	--	United Kingdom 23.
Columbium and tantalum:				
Ore and concentrate	--	6	6	
Ash and residue containing columbium and/or tantalum	30	31	11	Netherlands 20.
Metal including alloys, all forms, tantalum	1	1	--	Mainly to France.
Copper:				
Ore and concentrate	33,471	36,383	--	Peru 16,202; West Germany 10,948.
Metal including alloys:				
Scrap	978	301	--	Portugal 156; France 62.
Unwrought	74,391	73,322	--	France 26,741; Italy 20,925; Belgium-Luxembourg 13,533.
Semimanufactures	20,160	17,915	176	Iran 4,441; Morocco 3,243; Syria 1,313.
Gold: Metal including alloys, unwrought and partly wrought ___troy ounces	r537,877	38,243	--	Switzerland 30,385.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	1,147	1,869	--	Netherlands 816; West Germany 547.
Pyrite, roasted ___do	389	334	--	West Germany 306; France 27.
Metal:				
Scrap	502	746	--	Belgium-Luxembourg 487.
Pig iron, cast iron, related materials	32,249	17,567	110	Italy 6,841; United Kingdom 2,115.
Ferroalloys:				
Ferroaluminum	1,733	3,668	529	Mexico 769; Belgium-Luxembourg 740.
Ferrochromium	8,927	8,179	--	United Kingdom 3,278; France 2,464.
Ferromanganese	32,031	22,057	--	Italy 11,091; Romania 4,549.
Ferromolybdenum	291	269	--	Netherlands 218; Sweden 34.
Ferrosilicomanganese	6,583	10,282	368	France 7,145; Japan 1,999.
Ferrosilicon	42,634	16,534	--	West Germany 5,011; United Kingdom 4,781; Japan 4,004.
Silicon metal	5,974	1,937	--	Japan 994; France 943.
Steel, primary forms	634,380	633,408	--	France 156,707; Brazil 60,548; Algeria 51,056.
Semimanufactures:				
Bars, rods, angles, shapes, sections___ thousand tons	3,181	2,888	190	Morocco 312; Iran 242; Algeria 124.
Universals, plates, sheets	863,719	863,491	122,015	Iran 171,498; West Germany 59,591.
Hoop and strip	22,085	17,369	310	West Germany 2,904; France 2,617.
Rails and accessories	15,647	1,788	--	Nicaragua 1,210; Venezuela 241.
Wire	41,722	42,048	1,071	Algeria 8,373; Portugal 7,200.
Tubes, pipes, fittings	421,557	433,708	76,501	Iran 59,944; Algeria 31,072.
Castings and forgings, rough	11,219	9,126	863	Iraq 4,622; France 1,442.
Lead:				
Ore and concentrate	32,183	20,364	--	Mexico 13,004; United Kingdom 2,853.
Metal including alloys:				
Scrap	66	131	--	All to United Kingdom.
Unwrought	23,379	33,344	15	U.S.S.R. 28,070; France 2,023.
Semimanufactures	7,500	125	18	United Kingdom 43; Portugal 28.
Manganese:				
Ore and concentrate, metallurgical-grade	91	92	--	Portugal 69; Italy 23.
Metal including alloys, all forms	89	(2)	--	NA.
Mercury ___ 76-pound flasks	21,518	17,840	2,495	India 5,134; Netherlands 2,727.

See footnotes at end of table.

Table 3.—Spain: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Nickel:				
Matte and speiss	20	6	--	All to Netherlands.
Metal including alloys:				
Scrap	79	24	--	All to United Kingdom.
Unwrought	1	4	--	Do.
Semimanufactures	19	24	17	Angola 1; Italy 1.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	19,066	10,561	3,898	Switzerland 3,518; West Germany 2,866.
Silver:				
Ore and concentrate[3] value, thousands	$172	$197	--	All to United Kingdom.
Metal including alloys, unwrought and partly wrought thousand troy ounces	[r]3,800	3,293	(2)	United Kingdom 1,787; West Germany 427.
Tin:				
Ore and concentrate	(2)	17	--	All to Netherlands.
Metal including alloys:				
Scrap	91	53	--	All to United Kingdom.
Unwrought	248	84	--	United Kingdom 62; France 12.
Semimanufactures	17	6	--	Nicaragua 2; France 1.
Titanium:				
Ore and concentrate	25	3	--	Colombia 2; Portugal 1.
Oxides	22,001	19,454	7,305	France 3,712; United Kingdom 1,549.
Metal including alloys, all forms	11	3	--	Italy 2; Belgium-Luxembourg 1.
Tungsten:				
Ore and concentrate	621	686	--	West Germany 530; Netherlands 141.
Metal including alloys, all forms	23	40	--	Netherlands 19; United Kingdom 11.
Uranium and/or thorium: Ore and concentrate	--	18	--	All to United Kingdom.
Zinc:				
Ore and concentrate	44,376	27,086	--	France 12,618; Belgium-Luxembourg 5,275.
Blue powder	893	70	--	France 65.
Matte	582	775	--	West Germany 733.
Metal including alloys:				
Scrap	--	1,069	--	Netherlands 1,068.
Unwrought	88,203	94,108	2,998	Netherlands 26,198; India 22,252.
Semimanufactures	404	262	--	West Germany 112; Equatorial Guinea 86.
Zirconium: Ore and concentrate	75	23	--	All to Portugal.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1,582	2,094	(2)	West Germany 859; Portugal 276.
Artificial:				
Corundum	4,025	4,741	--	West Germany 2,338; Italy 968.
Silicon carbide	2,415	2,396	--	France 1,348; Belgium-Luxembourg 768.
Dust and powder of precious and semiprecious stones including diamond kilograms	37	44	4	Mozambique 30; Mexico 5.
Grinding and polishing wheels and stones	3,838	3,230	165	West Germany 1,110; France 356.
Asbestos, crude	12	41	--	Mexico 35; Morocco 3.
Barite and witherite	65,827	52,740	54	West Germany 20,410; Egypt 7,786.
Boron materials: Crude natural borates	519	506	--	Portugal 336; Tunisia 120; France 46.
Cement thousand tons	9,226	11,918	234	Saudi Arabia 4,605; Nigeria 1,602.
Chalk	25,709	21,424	--	Algeria 6,027; Libya 6,000.
Clays, crude:				
Andalusite, kyanite, sillimanite	122	150	--	Netherlands 86; France 24.
Bentonite	29,689	30,554	250	Portugal 16,082; Tunisia 3,060.
Chamotte earth	3,916	232	--	Saudi Arabia 127; Morocco 45.
Kaolin	51,809	51,156	2	West Germany 18,116; Ireland 8,676.
Unspecified	38,227	49,451	--	Netherlands 15,749; France 9,154.
Diamond:				
Gem, not set or strung carats	7,680	20,040	--	Belgium-Luxembourg 10,385; United Arab Emirates 4,345.
Industrial do	41,340	39,320	--	France 35,970; Mexico 3,350.
Diatomite and other infusorial earth	2,505	1,852	--	West Germany 446; United Kingdom 355.
Feldspar	1,833	1,846	--	United Kingdom 1,105; France 429.

See footnotes at end of table.

Table 3.—Spain: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials: Crude, n.e.s	5,266	3,193	--	France 1,657; United Kingdom 1,280.
Fluorspar	152,826	119,570	47,852	Canada 19,279; Italy 17,480.
Graphite, natural	197	690	--	France 685.
Gypsum and plaster thousand tons	1,083	1,120	291	Sweden 170; Denmark 163.
Iodine	--	1	--	All to Portugal.
Lime	5,497	3,974	--	Guinea 2,000; Portugal 1,007.
Magnesite	[r]92,925	105,443	--	United Kingdom 27,232; France 24,899.
Meerschaum, amber, jet	281,223	310,574	--	West Germany 98,602; France 97,039.
Mica:				
Crude including splittings and waste	2,683	2,022	--	United Kingdom 1,880; Algeria 100.
Worked including agglomerated splittings	202	140	--	West Germany 42; Italy 39.
Nitrates, crude	100	561	--	Portugal 524.
Pigments, mineral:				
Natural, crude	306	256	--	France 201; Portugal 24.
Iron oxides and hydroxides, processed	10,731	9,439	680	West Germany 929; United Kingdom 722.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$324	$347	--	Thailand $129; Switzerland $88.
Synthetic do.	$558	$514	$10	Switzerland $415; Italy $45.
Pyrite, unroasted	378,678	347,438	--	Belgium-Luxembourg 187,628; Greece 75,107.
Salt and brine	336,257	580,702	295,432	Norway 62,089; Iceland 58,370.
Sodium compounds, n.e.s.: Carbonate, manufactured	33,097	28,126	--	Iran 15,600; Argentina 12,516.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	188,792	175,037	902	Italy 127,677; France 12,122.
Worked	200,901	202,885	4,268	France 142,758; West Germany 23,440.
Dolomite, chiefly refractory-grade	88,810	79,557	--	United Kingdom 65,994; West Germany 10,542.
Limestone other than dimension	3,300	23,449	--	All to Belgium-Luxembourg.
Quartz and quartzite	327,977	297,692	--	Andorra 213,225; Sweden 43,985.
Sulfur: Elemental:				
Crude including native and byproduct	2,145	1,476	--	France 1,465.
Colloidal, precipitated, sublimed	10,487	5,027	--	Algeria 4,980.
Talc, steatite, soapstone, pyrophyllite	7,440	9,165	--	Belgium-Luxembourg 3,049; United Kingdom 2,422.
Vermiculite	386	2,804	--	Belgium-Luxembourg 2,500.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	12,342	7,892	--	Nigeria 2,899; Senegal 2,464.
Carbon: Carbon black	12,797	10,069	--	Portugal 6,174; Morocco 3,270.
Coal:				
Anthracite and bituminous	[r]9,558	12,670	--	Belgium-Luxembourg 12,277.
Briquets of anthracite and bituminous coal	[r]4,515	4,672	--	United Kingdom 4,660.
Petroleum:				
Crude thousand 42-gallon barrels	530	1,243	--	Libya 1,198; Saudi Arabia 45.
Refinery products:				
Liquefied petroleum gas do.	11	91	--	Sweden 43; Netherlands 24.
Gasoline do.	810	122	--	Andorra 94; Equatorial Guinea 26.
Mineral jelly and wax do.	14	14	--	Mexico 12.
Kerosine and jet fuel do.	772	1,441	--	Belgium-Luxembourg 310; Egypt 304.
Distillate fuel oil do.	2,879	4,560	--	Italy 709; France 605; bunkers 687.
Lubricants do.	2,242	3,022	79	France 1,122; Italy 853.
Residual fuel oil do.	13,879	31,146	512	Netherlands 8,690; United Kingdom 4,611.
Bitumen and other residues do.	3,425	4,111	--	Libya 2,302; Nigeria 717.
Bituminous mixtures do.	767	631	--	Libya 342; Nigeria 115.
Petroleum coke do.	8	5	--	Portugal 4; Benin 1.
Unspecified do.	NA	3,085	--	Netherlands 1,800; United Kingdom 543.

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[r] Revised. NA Not available.

[1] Table prepared by Tracy A. Leffingwell.

[2] Less than 1/2 unit.

[3] May include other precious metals.

Table 4.—Spain: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Alkali metals	145	116	(2)	West Germany 98; France 13.
Aluminum:				
Ore and concentrate	825,546	919,062	--	Guinea 816,439; Guyana 49,313.
Oxides and hydroxides	228,727	37,284	17	France 28,728; West Germany 5,236.
Metal including alloys:				
Scrap	5,778	8,909	1,327	France 3,238; Portugal 2,894.
Unwrought	13,642	18,324	1	Iceland 4,994; Switzerland 3,581; Norway 3,475.
Semimanufactures	14,067	18,454	1,078	West Germany 5,406; France 3,786.
Antimony:				
Ore and concentrate	480	433	--	Thailand 178; Morocco 153.
Metal including alloys, all forms	47	30	(2)	Hong Kong 14; Japan 6.
Bismuth: Metal including alloys, all forms	73	123	9	Peru 29; Belgium-Luxembourg 26; Mexico 24.
Cadmium: Metal including alloys, all forms	10	1	(2)	Mainly from Belgium-Luxembourg.
Chromium:				
Ore and concentrate	70,330	72,233	--	Republic of South Africa 30,200; Turkey 21,167.
Metal including alloys, all forms	13	22	(2)	United Kingdom 14; West Germany 4.
Cobalt: Metal including alloys, all forms	118	247	8	West Germany 84; Finland 56.
Columbium and tantalum: Metal including alloys, all forms:				
Columbium (niobium) kilograms	^{r}5,520	514	--	All from West Germany.
Tantalum do.	^{r}1,084	2,346	2,154	West Germany 162.
Copper:				
Ore and concentrate	152,754	127,518	--	Mexico 39,771; Chile 32,645; Papua New Guinea 32,610.
Matte and speiss including cement copper	8,660	18,155	--	Israel 5,518; Chile 4,499.
Metal including alloys:				
Scrap	32,236	43,722	9,995	France 9,528; West Germany 3,071.
Unwrought	51,984	35,669	62	Chile 24,590; Belgium-Luxembourg 9,548.
Semimanufactures	48,728	37,068	559	France 15,197; West Germany 4,409.
Germanium: Metal including alloys, all forms	10	2	--	All from Japan.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	^{r}6,141	9,690	--	West Germany 4,004; Switzerland 2,043.
Iron and steel:				
Iron ore and concentrate including roasted pyrite thousand tons	4,698	4,620	--	Brazil 2,262; Venezuela 629; Liberia 589.
Metal:				
Scrap do.	^{r}4,687	4,536	861	United Kingdom 2,054; France 691.
Pig iron, cast iron, related materials	159,847	203,589	31	West Germany 87,035; Brazil 33,900.
Ferroalloys:				
Ferrochromium	21,442	29,634	4	Republic of South Africa 12,216; Zimbabwe 6,666.
Ferromanganese	509	1,444	--	Brazil 1,027; France 175.
Ferromolybdenum	78	133	--	Belgium-Luxembourg 51; West Germany 49.
Ferronickel	3,563	4,296	45	France 2,208; New Caledonia 1,126.
Ferrosilicochromium	1,271	2,394	--	Zimbabwe 1,560.
Ferrosilicomanganese	104	405	--	Brazil 203; Republic of South Africa 200.
Ferrosilicon	3,259	2,650	--	France 1,304; Bulgaria 500.
Silicon metal	180	248	--	Republic of South Africa 204.
Unspecified	2,371	3,112	222	France 1,306; West Germany 849.
Steel, primary forms	530,858	800,619	8,201	France 258,098; West Germany 127,790; Netherlands 104,408.
Semimanufactures:				
Bars, rods, angles, shapes, sections	188,894	203,913	558	West Germany 64,990; France 40,395.
Universals, plates, sheets	295,945	337,430	3,732	France 96,585; West Germany 77,898.
Hoop and strip	62,529	74,537	1,126	West Germany 28,064; France 20,849.
Rails and accessories	2,409	2,125	7	United Kingdom 477; France 471.
Wire	13,532	15,744	35	Belgium-Luxembourg 5,020; France 4,395.
Tubes, pipes, fittings	56,355	79,336	5,163	France 27,653; West Germany 22,670.
Castings and forgings, rough	2,532	533	24	France 274.

See footnotes at end of table.

Table 4.—Spain: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Lead:				
Ore and concentrate	28,190	66,115	5,000	Morocco 24,079; Greenland 15,528.
Ash and residue containing lead	8,250	10,081	174	Belgium-Luxembourg 5,358; Portugal 2,750.
Metal including alloys:				
Scrap	1,920	376	161	France 139; United Kingdom 36.
Unwrought	7,174	6,496	38	West Germany 2,342; France 2,011.
Semimanufactures	155	143	79	West Germany 38; Italy 13.
Lithium:				
Ore and concentrate	433	233	1	Netherlands 186; Belgium-Luxembourg 46.
Metal including alloys, all forms	(2)	11	11	
Magnesium: Metal including alloys:				
Unwrought	1,121	909	424	France 278; Norway 79.
Semimanufactures	54	60	17	West Germany 21; France 17.
Manganese:				
Ore and concentrate, metallurgical-grade	253,991	260,600	18	Republic of South Africa 131,449; Gabon 79,690.
Metal including alloys, all forms	1,342	454	64	Republic of South Africa 311; France 37.
Mercury 76-pound flasks	18	18	1	West Germany 9; Austria 3.
Molybdenum:				
Ore and concentrate	1,817	2,283	261	United Kingdom 1,165; Chile 267.
Metal including alloys:				
Unwrought	3	8	5	United Kingdom 3.
Semimanufactures	1,038	28	12	West Germany 6; Austria 3.
Nickel:				
Ore and concentrate	NA	10	--	All from Sweden.
Matte and speiss	2,244	2,353	45	Cuba 1,634; Australia 210.
Metal including alloys:				
Scrap	2	27	3	West Germany 21.
Unwrought	3,670	5,036	973	Canada 904; Republic of South Africa 618.
Semimanufactures	1,332	479	26	West Germany 135; France 103.
Platinum-group metals:				
Waste and sweepings value, thousands	$5,905	$10,620	--	France $9,469; West Germany $733.
Metals including alloys, unwrought and partly wrought troy ounces	[r]270,123	43,726	2,169	Switzerland 5,718; France 4,985.
Rare-earth metals	14	12	(2)	Austria 6; West Germany 6.
Silicon, high-purity	161	345	(2)	Mainly from France.
Silver:				
Ore and concentrate[3] value, thousands	$7,804	$11,975	$459	Morocco $3,513; Papau New Guinea $3,444.
Waste and sweepings[3] do	[r]$25,604	$37,792	$418	France $29,741; Switzerland $3,512.
Metal including alloys, unwrought and partly wrought thousand troy ounces	[r]554	947	1	United Kingdom 471; West Germany 248.
Tin:				
Ore and concentrate	4,071	2,884	--	Thailand 1,052; United Kingdom 787.
Metal including alloys:				
Unwrought	38	326	(2)	United Kingdom 131; Malaysia 70.
Semimanufactures	58	41	(2)	West Germany 14; United Kingdom 12.
Titanium:				
Ore and concentrate	146,798	138,556	--	Norway 72,342; Australia 65,968.
Oxides	2,919	4,632	55	Belgium-Luxembourg 2,870; West Germany 740.
Metal including alloys, all forms	280	1,390	289	France 991; Italy 36.
Tungsten: Metal including alloys, all forms	[r]13	25	(2)	Netherlands 11; Italy 3.
Uranium and/or thorium:				
Ore and concentrate	275,088	393,974	--	Guinea 393,968.
Metal including alloys, all forms kilograms	717	418	--	West Germany 368; United Kingdom 50.
Zinc:				
Ore and concentrate	54,276	69,449	--	Ireland 38,227; Peru 29,601.
Blue powder	27	36	--	Netherlands 22; Belgium-Luxembourg 13.
Matte	3,989	4,852	106	West Germany 1,894; France 637.

See footnotes at end of table.

Table 4.—Spain: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Zinc —Continued				
Metal including alloys:				
Scrap	408	296	--	Algeria 130; France 111.
Unwrought	753	3,810	--	Belgium-Luxembourg 2,595; West Germany 669.
Semimanufactures	368	809	(2)	France 363; Belgium-Luxembourg 253.
Zirconium:				
Ore and concentrate	37,585	17,380	--	Republic of South Africa 8,740; Australia 8,504.
Metal including alloys kilograms	1,042	2,032	514	West Germany 1,000; Sweden 272.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1,203	2,359	14	Greece 1,815; Italy 408.
Artificial:				
Corundum	4,198	4,444	--	West Germany 1,557; France 1,484.
Silicon carbide	1,016	673	1	West Germany 329; Norway 256.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$3,606	$3,866	$1,896	Ireland $1,829.
Grinding and polishing wheels and stones	1,493	1,788	53	Italy 577; France 325.
Asbestos, crude	59,938	53,224	166	Zimbabwe 17,190; Canada 12,291.
Barite and witherite	567	1,429	--	Morocco 1,020; France 398.
Boron materials: Crude natural borates	86,423	76,790	43,712	Turkey 27,637; France 2,873.
Bromine	275	290	--	Israel 160; France 115.
Cement	50,799	297,875	35	Belgium-Luxembourg 129,927; France 96,538.
Chalk	6,783	6,286	6	France 6,221.
Clays, crude:				
Andalusite, kyanite, sillimanite	2,039	2,643	208	Republic of South Africa 1,194; France 704.
Bentonite	27,977	28,792	3,046	Morocco 18,376; Greece 6,085.
Chamotte earth	4,986	7,187	1,998	France 5,066; West Germany 97.
Kaolin	166,786	176,301	4,564	United Kingdom 143,090; Brazil 13,688.
Cryolite and chiolite	1,115	2,128	--	All from Denmark.
Diamond:				
Gem, not set or strung carats	264,160	119,987	--	Belgium-Luxembourg 67,360; India 17,318.
Industrial:				
Natural do	95,360	32,974	--	Netherlands 16,218; Republic of South Africa 14,083.
Synthetic do	42,250	201,865	158,515	Ireland 28,350; Italy 15,000.
Diatomite and other infusorial earth	2,938	2,244	684	France 1,437; West Germany 56.
Feldspar, fluorspar, related materials:				
Feldspar	15,668	15,237	20	France 14,232.
Fluorspar	1,452	1,517	--	Italy 1,343; France 156.
Unspecified	3,937	735	--	Norway 336; Canada 284.
Fertilizer materials: Crude, n.e.s	2,828	4,419	(2)	Netherlands 2,609; France 1,386.
Graphite, natural	1,405	2,447	--	China 822; Madagascar 729.
Gypsum and plaster	2,925	1,878	4	France 859; Morocco 598.
Iodine	175	158	--	Japan 156.
Lime	429	162	--	France 94; Morocco 54.
Magnesium compounds:				
Magnesite	31,344	42,617	590	Greece 21,882; Italy 5,547.
Other	45,720	13,899	685	Greece 6,100; Italy 4,927.
Mica:				
Crude including splittings and waste	1,358	1,164	21	France 347; India 298.
Worked including agglomerated splittings	173	151	67	Belgium-Luxembourg 33; France 18.
Nitrates, crude	17,047	43,750	--	All from Chile.
Phosphates, crude thousand tons	2,399	2,391	--	Morocco 2,230; Togo 90.
Pigments, mineral:				
Natural, crude	^{r}301	276	--	United Kingdom 107; West Germany 89.
Iron oxides and hydroxides, processed	6,908	6,422	27	West Germany 5,651; France 435.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$7,327	$6,324	$8	Thailand $3,690; India $1,029.
Synthetic do	^{r}$1,072	$1,165	$29	Austria $334; Switzerland $304.
Pyrite, unroasted	205	115	--	Italy 107; West Germany 5.

See footnotes at end of table.

Table 4.—Spain: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Quartz crystal, piezoelectric kilograms	--	180	30	Brazil 100; Madagascar 50.
Salt and brine	1,565	1,599	6	United Kingdom 883; Netherlands 648.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	1,730	3,926	(2)	Romania 2,000; Bulgaria 1,528.
Sulfate, manufactured	4,603	689	(2)	France 375; West Germany 257.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	109,359	113,718	(2)	Italy 45,234; Portugal 35,287.
Worked	6,694	7,690	1	Italy 5,216; Portugal 2,026.
Dolomite, chiefly refractory-grade	4,376	4,644	--	France 2,691; Norway 1,784.
Gravel and crushed rock	56,744	47,032	--	Morocco 39,889; France 6,567.
Quartz and quartzite	2,922	7,347	17	Yugoslavia 4,205; Sweden 1,689.
Sand other than metal-bearing	20,878	32,557	34	Morocco 25,356; France 5,228.
Sulfur:				
Elemental:				
Crude including native and byproduct	112,950	91,331	18	France 74,838; Mexico 16,100.
Colloidal, precipitated, sublimed	538	531	(2)	West Germany 519.
Dioxide	60	18	--	Mainly from France.
Sulfuric acid	130,624	42,506	4	France 20,982; Netherlands 11,097.
Talc, steatite, soapstone, pyrophyllite	10,315	9,141	134	France 6,403; Norway 1,702.
Vermiculite	40,611	24,637	--	U.S.S.R. 23,826.
Other:				
Crude	[r]22,973	16,464	125	Morocco 7,345; Norway 3,085.
Slag and dross, not metal-bearing	8,052	4,390	330	France 1,452; United Kingdom 1,327.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	16,333	15,006	640	France 11,374; West Germany 1,428.
Coal:				
Bituminous including anthracite thousand tons	7,045	7,176	5,161	Republic of South Africa 711; Poland 615; Australia 587.
Briquets of anthracite and bituminous coal do	--	13	9	United Kingdom 4.
Lignite including briquets	6,811	4,512	--	France 4,488.
Coke and semicoke	420,254	286,541	35,285	Poland 68,457; France 54,204.
Gas, natural: Liquefied thousand tons	1,583	1,671	--	Algeria 920; Libya 751.
Petroleum:				
Crude thousand 42-gallon barrels	296,974	310,303	172	Saudi Arabia 81,116; Mexico 61,286.
Refinery products:				
Liquefied petroleum gas do	11,379	15,982	293	Saudi Arabia 5,500; France 3,165.
Gasoline do	6,430	4,118	(2)	Romania 2,121; Italy 869.
Naphtha and white spirit do	NA	6,490	--	U.S.S.R. 1,780; Italy 930.
Mineral jelly and wax do	28	24	1	Netherlands 8; West Germany 4.
Kerosine and jet fuel do	699	881	(2)	Italy 465; Sweden 124.
Distillate fuel oil do	2,851	7,476	821	U.S.S.R. 4,833; Algeria 572.
Lubricants do	336	377	65	France 196; United Kingdom 64.
Residual fuel oil do	8,850	5,719	1,511	East Germany 993; U.S.S.R. 729.
Petroleum coke do	3,260	6,336	5,884	United Kingdom 378; West Germany 49.

[r] Revised. NA Not available.

[1] Table prepared by Tracy A. Leffingwell.

[2] Less than 1/2 unit.

[3] May contain other precious metals.

COMMODITY REVIEW

METALS

Aluminum.—The financial situation of the aluminum sector in Spain remained difficult. The Government, through the Instituto Nacional de Industria (INI), had problems with two foreign shareholders, Pechiney S.A. and Alcan Aluminium Ltd., regarding the price of electricity and the price of alumina from the San Ciprián plant, which supplied alumina to all aluminum plants in the country. The foreign partners considered both prices too high.

During the summer, Empresa Nacional del Alúminio S.A. restarted one potline at Avilés. It will reportedly increase the operating capacity by an additional 2,000 tons per year to 45,000 tons per year. These moves were due to increased prices for aluminum on the international market.

Copper.—The Aznalcóllar Mine, which produced copper, lead, and zinc concentrates with recovery of gold from complex sulfide ore, started production again. This mine had been closed in 1982 because of financial difficulties caused by a severe drought.

The Sotiel Mine at Sotiel-Coronada, near Huelva in southern Spain, also rated at 500,000 tons of complex sulfide ore per year, started production for the first time. Concentrates of copper, lead, and zinc were produced.

The Spanish Government's Executive Commission for Planning approved only partially a plan for restructuring the copper semimanufactures and alloys industry. The plan that originally assigned about $32 million[2] was cut back to about $14 million. Cuts in the labor force were also part of the plan.

Iron and Steel.—Under political pressures from the labor union, the Government of Spain authorized $150 million for the development of two mines and construction of a pelletizing installation. The Government of Spain, through INI, holds 24% of the capital of the Prereducidos Integrales del Suroeste de España S.A. (Presur) and an additional 28% is held by the domestic steel industry and domestic banks. The rest is held by two companies from the Federal Republic of Germany and one from Kuwait. At yearend, Kuwait and domestic steel companies reportedly opted to withdraw from the venture and INI would presumably replace them. Presur was planning to develop iron mines at Calva in the Province of Huelva and at La Berrona and built a 1-million-ton-per-year pellet plant at Fregenal de la Sierra in Badajoz Province. Ore at Cala and La Berrona had an average iron content of 30% and a copper content ranging between 0.15% and 0.50%. The capacity of the mines was reported at 3 million tons per year of ore and reserves were set at 54 million tons. At the Calva Mine, production with upgrading was planned to yield about 630,000 tons of iron concentrate with an average iron content of 60% and 10,000 tons of copper concentrate with an average copper content of 20%. At the La Berrona Mine, production of 700,000 tons per year of iron concentrate was planned. Iron concentrates from both mines will be shipped to a pelletizing plant at Fregenal de la Sierra. After removing potash present in the concentrates, about 1 million tons of pellets for use in the steel plants of Ensidesa should be produced. Work on mines started in the summer and reduction of pellets was scheduled to start in 1985.

Cía. Andalusa de Minas S.A., which operates the Marquesado iron ore mine near Alquife, Granada Province, ordered two Jones-type high-intensity, wet-magnetic separators, model DP 317 from Humbolt Wedag AG of the Federal Republic of Germany. The ore in Marquesado is very soft and breaks easily. Presently only lump ore between 6 and 40 millimeters has been concentrated in the heavy-media plant and the fines were shipped without beneficiation. To meet the demand for sintered feed with a higher iron content and reduced alkali content, a 200-ton-per-hour-capacity iron ore plant was planned for the fines. The ore (4 to 6 millimeter fraction) will be crushed to less than 1 millimeter and then concentrated by the two magnetic separators. Installation was planned for production in 1984.

The growing indebtedness of the Spanish steel industry made the need for reorganization even more urgent. The Government plan provided for closure of plants and concentration of production of some products in one single facility. Most of the changes were planned for the period starting in 1987 and ending in 1990. Owing to fast changing conditions in the sector, and in the world economy, the present plant may be modified in the future.

After a long negotiation between the unions, steel companies, and the Government of Spain, which ended in discord, the Government ruled that the steel plant at Sagunto would be closed. The Government planned to bring new industry to Sagunto to provide employment for former steel workers.

During the summer, severe floods in the Basque country severely damaged a number of steelworks in the area. The Altos Hornos de Vizcaya S.A. plants suffered most of the damage and among them the Echevarri plant was severely damaged. During the repair of electric installations the 2,600 workers of the plant were laid off for 3 months.

Lead and Zinc.—By world standards, Spain remained a modest producer of lead and zinc ore and metals. Demand, far lower than in previous years, forced some operations to lower their production; however, exploration continued. Most important, exploratory work was conducted on two lead and zinc deposits, one in the Toral de los Vades area of Ponferrada, Province of León, and the other at Navalmedio near Almadén. At yearend, both properties were preparing for final decisions on development. The Toral deposit was explored by a geologist from Peñarroya and the Government-owned Empresa Nacional Adaro de Investigaciones Mineras S.A. (Enadimsa), under the auspicies of the PNAMP. The Navalmedio deposit was explored by a geologist from the Almadén Mine and in its initial stage was financed by the Almadén Mine, which is Government-owned.

Mercury.—The Almadén region remained the only producer of mercury in Spain; it was among the largest world producers during 1983. Three mines were in operation; two were in full production and one at Las Cuevas, about 8 kilometers north of Almadén, was still under development.

The world situation on the mercury market has affected Almadén's operations. Because of low prices and the worldwide use of reclaimed mercury, the Almadén Mine started negotiations with the Government to soften the impact of low prices on its operations. Reportedly, as a relief measure, the Government agreed to start stockpiling mercury by purchasing, at an undisclosed price, the difference between the production and sales of mercury by Almadén.

Silicon.—Silicón de Sabón S.A., the Spanish silicon metal producer, a subsidiary of Carburos Metálicos S.A., restarted production of a 5,000-ton-per-year furnace. The startup of production was made possible by better prices on the silicon market and by an agreement with the Spanish Government on a reduced rate for electricity.

Tungsten.—Joint exploration by the Promotora de Recursos Naturales S.A., owned by the Banco de Bilbao, and Billiton Española S.A., owned by the Shell Co., resulted in the discovery of a wolfram deposit southeast of Guijuelo in Salamanca Province. The discovery was made in a reportedly virgin region after geological and geophysical exploration, drilling of 600 meters of hole, and digging of 1,500 meters of exploratory trenches. Reportedly, reserves amounted to 100 million tons of ore with an average content of 8 kilograms of wolfram per ton of ore. During 1984, after all results of exploration and economic studies are assessed, a decision will be made on future actions on the deposit. The domestic partner, Promotora de Recursos Naturales, holds 51% interest in the venture and Billiton Española controls the rest.

NONMETALS

Granite.—A new granite quarry started production at Barcarota and Savalleen in Badajoz Province. The owner was Granitos de Barcarota S.A. INI, through Enadimsa and Sodiex S.A., holds 67% of the capital.

Sodium Sulfate (Natural).—In a joint venture Minerales y Productos Derivados S.A. (Minersa) of Spain and Industrias Peñoles S.A. de C.V. (PEÑOLES) of Mexico discovered a deposit of natural sodium sulfate north of the Tajo River between the villages of Villaconejos and Titulcia, northeast of Aranjuez. The deposit consists of horizontal 25-meter-thick beds. They were made up predominately of glauberite and the content of sodium sulfate (Na_2SO_4) was consistent at 40% to 42% throughout the ore body. Proven reserves were reported at 5.2 million tons of Na_2SO_4. The ore body was covered with overburden 20 to 21 meters thick. The new mine was a solution opencast mine, in which water was added to the broken ore in the pit, and a 90,000-ton-per-year crystalization processing plant was built at the minesite. The operating company was Silquisa, in which Minersa held 54% and PEÑOLES held 46% interest.

Even before startup of the new mine Spain was the only established producer of natural sodium sulfate in Western Europe. The principal producer was, and remained in 1983, Minerales y Productos Derivados S.A., which operated facilities at Cerezo in Burgos Province and Villarrubia de Santiago in Toledo Province.

Other Nonmetals.—Spain produced a large variety of nonmetallic minerals during the year. However, the production rates reflected the country's sluggish economy and the year was uneventful.

MINERAL FUELS

The energy position of Spain remained unchanged. Imports of liquid and gaseous hydrocarbons severely burdened the foreign trade balance of the country. Domestic coal and nuclear power were developed with an aim to lower energy imports in the future.

Recently discovered gasfields in Spain,

including offshore fields, have raised high hopes that domestic production of natural gas may significantly decrease import dependency. Development of the El Serrablo onshore field was underway. Reportedly, commercial production was slated for 1984. Development of the Gaviota offshore field in the Atlantic started, and first commercial production was planned for 1986. However, after initial optimism the state-owned Empresa Nacional del Gas S.A. (ENAGAS) published estimated reserves of natural gas in Spain that were lower than reported in preliminary reports. ENAGAS estimates total reserves of natural gas at 2,250 billion cubic feet.

Although domestic natural gas resources are inadequate, Spain continued to build gas pipelines for imported gas. ENAGAS started on construction of pipelines that will make gas available in the southeastern and central regions of Spain. Cost of the project was estimated at an equivalent of $100 million, and its completion is expected in 1986 instead of 1988 as previously planned.

Negotiations for a new natural gas purchase contract with Algeria were underway. The negotiations were aimed at halving Algerian deliveries from the quantities Spain is committed to take under the contract signed in 1974 because of lowered demand, particularly in powerplants. Reportedly, the new quantities should be between 70 and 87 billion cubic feet per year, and the prices should be close to $3.90 per million British thermal units, which is similar to the price paid by France and Italy for natural gas purchased in Algeria. This should alleviate the financial losses of $83 million suffered by ENAGAS in recent years.

Exploratory drilling activities for liquid and gaseous hydrocarbons continued, but reportedly most of the wells drilled were dry. The modest domestic production of crude oil is obtained from four offshore fields, all in the Mediterranean, and one onshore field. Aposta offshore field was owned by Shell España N.V. (operator), 51.7%; Empresa Nacional de Investigacion y Exploracion de Petróleos S.A. (Eniepsa), 24%; and Coparex Española S.A., 16%. Casablanca Field, at the Ebro River estuary, was owned by Eniepsa (operator), 37.77%; Chevron Oil Co. of Spain, 19.25%; Canada North West Land Ltd., 12.45%; Denison Mines Ltd., 12.45%; Compañia Española de Petróleos S.A., 7.29%; Petrocanada Ltd., 7.58%; and Amoco España Exploration Co., 3.11%. Dorado offshore field was owned by Eniepsa (operator), 35%; Union Texas España Inc., 32.5%; and Getty Oil Co. of Spain S.A., 32.5%. The Tarraco offshore field, southwest of Casablanca Field, was owned by Shell (operator), 75%, and Compañia Arrendataria del Monopolio de Petróleos S.A., 25%.

Ayoluengo onshore field was operated by Government-owned Eniepsa. Shell returned to the Mar Cantabrico permit area where one well tested heavy crude oil in 1980. Two wells were planned for 1983 and reportedly they were underway at yearend. Although the Government of Spain was involved in the energy sector, the Government recognized the need for private investment in exploration and development. Consequently, financial terms were set at fairly attractive levels. There was no royalty, and tax was levied at 40% on profits.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary values have been converted from Spanish pesetas (Ptas) to U.S. dollars at the rate of Ptas125=US$1.00.

The Mineral Industry of Sudan

By Kevin Connor[1]

The mineral industry continued to be of minor significance to the economy of Sudan in 1983. Exploration and development work in the gold and petroleum sectors highlighted an otherwise uneventful year for the industry. Five ancient gold mining locations were evaluated during the year with promising results at all of them. Commercial gold production operations were scheduled to commence at one of these sites early in 1984. Chevron Oil Co. of Sudan and the White Nile Petroleum Co. (WNPC) continued with exploration and development projects in south-central and eastern Sudan, and finalized construction plans for the Unity Oilfield to Red Sea crude petroleum pipeline system, with construction work to begin early in 1984.

Negotiations continued throughout 1983 without finalization between the Government-owned Ingessana Hills Mining Corp. and the Arab Mining Co. over a partial takeover by the Jordan-based mining firm of the chromite ore mining operation in the deposits of Ingessana Hills. The chromite operation was marked by continued serious financial and technical difficulties. The Government operated the high-grade deposit with antiquated equipment, a lack of spare parts and adequate repair facilities, and an unreliable ore transportation system to the Red Sea.

Since the formation of the Saudi Arabia-Sudan Red Sea Joint Commission in 1974, 18 Red Sea bottom trenches had been evaluated for their mineral potential by yearend 1983. An estimated $58 million had been spent on the Red Sea exploration efforts of the 10-year-old commission, based out of the Saudi Arabian capital of Jidda. Preliminary seabed mining tests were conducted in 1979, and a 1-year pilot operation test was scheduled for 1985 to further examine the commercial feasibility of extracting minerals from the sea's bottom. One of the 18 trenches studied by the commission was estimated to contain $5 billion in precious metals. Mineral tonnage estimates given for the trench were 2,000,000 tons of zinc, 500,000 tons of copper, 4,000 tons of silver, and 80 tons of gold.

During the year, the Ministry of Energy and Mining in Khartoum announced a new mineral development strategy for a variety of newly discovered small mineral deposits throughout the country. Small portable ore processing complexes would be used to treat material from several different minesites. The portable mills would make ore transport distances shorter and many smaller, low-grade mineral deposits more economically attractive.

The French agency, Bureau de Recherches Géologiques et Minières (BRGM), in conjunction with Sudan's Geological and Mineral Resources Department (GMRD) and the Government of Saudi Arabia, continued with geologic studies in several parts of Sudan throughout the year. BRGM announced late in 1983 that the exploration program had uncovered precious and base metals massive sulfide deposits. In the Red Sea Hills area at Jebel Ayoub, BRGM and GMRD further delineated tungsten deposits that could yield 150,000 tons of tungsten trioxide concentrate economically. In the Nuba Mountains area of central Sudan, a team of scientists from the Federal Republic of Germany discovered several uranium occurrences. The team completed detailed geologic mapping of a 4,000-square-kilometer area. Exploration in the Nuba region was scheduled to continue in 1984. Greenwich Resources Inc., a Canadian mining firm out of Vancouver, which was the principal gold exploration and development concern in Sudan during 1983, was also carrying out exploration surveys for tin and tungsten in areas to the north of Khartoum, and for uranium in the northern Kordofan Province. Detailed fieldwork was expected to begin at these sites early in 1984.

PRODUCTION AND TRADE

The mining industry produced on a limited scale chromite, gold, gypsum, manganese, mica, and salt. Cement production represented almost 60% of the estimated $17 million worth of nonfuel minerals produced and processed in Sudan in 1983. The country continued to export small quantities of unprocessed raw minerals or concentrates and internally generated scrap materials. These exports, mostly to Western Europe, consisted of ferrous and nonferrous scrap, locally mined chromite, gold, and a small amount of mica. Sudan's mineral imports were modest, with petroleum accounting for well over one-half of the country's imports. Other dominant mineral imports were iron and steel products, cement, and fertilizer materials. Major import trading partners were Japan, the Republic of Korea, Kuwait, Saudi Arabia, the United Kingdom, and other Western European countries.

Table 1.—Sudan: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
Cement, hydraulic ___ thousand tons	182	185	150	183	200
Chromium: Chromite concentrate, gross weight	28,176	25,400	25,515	[e]19,000	20,000
Gold, mine output, metal content[e] ___ troy ounces	300	300	300	400	500
Gypsum and anhydrite, crude[e]	10,000	10,000	[r]15,000	[r]15,000	15,000
Manganese ore	454	363	400	400	400
Mica, all grades	2,000	1,500	2,000	165	10
Petroleum refinery products:					
Gasoline ___ thousand 42-gallon barrels	1,200	1,118	1,099	1,000	1,000
Jet fuel ___ do	199	428	308	300	300
Kerosine ___ do	192	NA	NA	NA	NA
Distillate fuel oil ___ do	3,700	2,366	2,198	2,000	2,000
Residual fuel oil ___ do	1,900	--	2,419	2,000	2,000
Other ___ do	60	55	--	--	--
Refinery fuel and losses ___ do	350	299	296	300	300
Total ___ do	7,601	4,266	6,320	5,600	5,600
Salt	81,200	80,000	64,253	27,927	75,000

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through July 6, 1984.

[2] In addition to the commodities listed, modest quantities of a variety of crude construction materials (including clays, stone, and sand and gravel) presumably were produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels. Crude oil was produced from several wells on a testing basis but was not being produced for domestic use or export through yearend 1983.

COMMODITY REVIEW

METALS

Greenwich Resources of Canada announced in late 1983 plans to begin the underground development of it's Gebeit gold mine concession in early 1984. The proposed mining project, located in the Red Sea Hills area, would exploit one of a number of promising gold finds discovered by the Vancouver-based firm during a 6-year, $6 million exploration program. An additional $6 million was projected for rehabilitation costs, to be spent in 1984 preparing the old mining area for further exploitation. The Gebeit gold deposit was originally discovered and worked during 1910-29. The mine location produced approximately 100 troy ounces per month of gold during 1983 from the heap leaching of tailings piles.

By yearend, 41 diamond drill holes comprising 2,500 meters of drilling and coring had been completed at Gebeit, outlining stratabound gold mineralization over an area of 800 by 200 meters. The drilling program and analyses were conducted by

Robertson Research International Ltd., a London petroleum and mineral consultant group, which owned 15% of Greenwich Resources. Based on the analysis of the Gebeit cores, there was every indication that Gebeit would prove to be a valuable commercial operation, larger and more profitable than originally contemplated. Specifically the coring at west Gebeit outlined two flat lying lodes, the deeper of which did not outcrop on the surface but was delineated at depths of 15 to 65 meters. The mineralization was 1 to 3 meters thick and reserves as of yearend were estimated at 50,000 tons of 0.30 troy ounce of gold per ton of ore grade, and 100,000 tons of higher grade 0.39 troy ounce of gold per ton of ore. Overlying the deeper lode was a second mineralization intersected with both drill holes and surface trenching. Sampling analyses of this structure showed average values of 0.27 troy ounce of gold per ton of ore, but as of yearend not enough information had been gathered to estimate the lode's reserves. Initial underground development plans called for intersecting the top lode to gather bulk ore samples for further detailed geological information and estimating the lode's reserves.

Another very promising gold deposit investigation in 1983 by Greenwich Resources was at Jebel Negim on the banks of the Nile River, approximately 500 kilometers north of Khartoum. The site had been mined in ancient times and the early 1900's. Greenwich Resources reported two gold reefs in the area with a combined potential of 5,000 tons of gold ore per vertical meter of vein over a strike distance of 1.55 kilometers. A third gold exploration project by Greenwich Resources was underway late in 1983 at Shanobkwan, about 80 kilometers northwest of Port Sudan, where excellent gold values were encountered in samplings over a strike length of approximately 350 meters. The Sudanese Government had a 51% interest in all of the Greenwich Resources gold projects, which were being totally funded initially by Greenwich Resources. Exploration drilling, sampling, and analyses were expected to continue at all three sites in 1984.

NONMETALS

Limestone.—The British Ropeway Engineering Co. (BRECO) continued with construction work throughout the year on the 20-kilometer aerial transport system to carry limestone requirements for Maspio Cement Corp.'s Atbara cement plant. The cement plant, located north of Khartoum, was separated from the limestone quarry by over 20 kilometers of hills, flat lying desert terrain, and the Nile River. The previous transportation system consisted of 24 kilometers of railroad from the quarry to the west bank of the Nile River, and then a 2.5-kilometer ropeway, also built by BRECO, carrying the limestone across the river and to the Atbara cement plant. This system had only a capacity of 60 tons per hour. The limestone capacity requirement for the plant in 1983 was 2,400 tons per day. BRECO was awarded the contract for the new higher capacity ropeway by Sudan's Building Materials and Refractories Corp. in 1981.

This type of ropeway was considered particularly suitable to flat terrain and uses a single endless driving rope on which the transport buckets are both supported and moved throughout a closed system. The ropeway was designed for 215 tons per hour with 450 bottom-discharge buckets. Upon commencing operations, scheduled for mid-1984, the major 20-kilometer ropeway will transport limestone from the quarry across the Nile River to a stockpile on the river's east bank. From there the limestone was to be transported as necessary to the cement plant. When completed, the direct-current, motor-driven ropeway would be the longest single section of its type in the world.

Other Nonmetals.—Johns-Mansville Canada Inc. concluded that the large asbestos deposits of the Ingessana Hills were uneconomical to develop considering the assessed low grade of the deposits, lack of infrastructure in the area, and 1983 market conditions for asbestos. Maspio was scheduled to complete expansion and modernization work at its Atbara plant sometime during the fall. However, equipment installation delays and associated construction problems pushed back the completion date for the plant project until spring 1984. In the area of fertilizer production, Sudan-ReN Co. completed the construction on its ammonia and urea facility just south of Khartoum in mid-1983. Initial naphtha feedstock for the plant was to come through the petroleum products line that runs from Port Sudan to Khartoum, but Sudan-ReN officials were planning to replace naphtha imports with indigenous supplies from the newly developed oilfields of the country's central plains as soon as possible. The plant's capacity was 109,000 tons per year of N-ammonia and 46,000 tons per year of N-urea.

MINERAL FUELS

In October, WNPC and Chevron signed contracts worth over $380 million for the first phase of construction work on a 1,400-kilometer crude oil dual pipeline system linking the Heglig and Unity Oilfields in south-central Sudan to an export terminal near Port Sudan on the Red Sea. The contractor for both efforts, a consortium group led by Snam Progetti S.p.A. of Italy, an Ente Nazionale Idrocarburi subsidiary, was scheduled to begin work early in 1984. Other members of the consortium were Chiyoda Co. of Japan and Trafeb Corp., a joint U.S.-Saudi construction firm. The first contract, with WNPC, valued at approximately $300 million, was for the major construction work of the dual pipeline itself. The second contract, with Chevron, was for the construction of the necessary input-output oil preparation facilities for both pipelines in the oilfields of Heglig and Unity. The dual pipeline system as designed was to comprise a 22-inch crude oil line with an upper end capacity of 200,000 barrels per day carrying capability, and a parallel 8-inch products line to supply batched, clean, refined products for local consumption within Sudan's interior, and also to supply a dilutant for mixing with the 35° to 38° API waxy crude from the fields to facilitate pumping operations.

Well-pumping tests near yearend indicated that crude oil production from the two fields could be as high as 100,000 barrels per day initially in 1985 when the pipeline is slated for completion and ready for operation. The total cost of the pipeline system was estimated at $960 million, $200 million of which was to cover the cost of constructing the export terminal. Financing for the project, as of late in the year, was as follows: Advanced capital of $230 million was required from the four partners of WNPC. Export credits of $350 million from future crude production was to be given special exemption from future Sudan debt rescheduling by Western creditors. Finally, a commercial bank loan for $380 million was to be negotiated, $100 million of this coming from the International Finance Corp. of the International Bank for Reconstruction and Development and the remaining $280 million through commercial banks.

Negotiations were almost complete at yearend for the transfer of 25% of Chevron's major interests in Sudan, including the petroleum export pipeline and their exploration and production rights covering approximately 250,000 square kilometers of onshore concessions, to Shell Internationale Petroleum Maatschappij BV, an affiliate of the Royal Dutch/Shell Group. Shell's proposed participation had received approval from the Sudanese Government during the latter part of the year. The capital investments by Shell expected from the arrangement were to include both past and future Chevron expenditures. Finalization of the contract between the two international petroleum companies was expected early in 1984.

Chevron's exploration and evaluation program in 1983 utilized four seismic crews and three drilling rigs. A fourth rig had been mobilized late in the year for field development work in 1984. Eight petroleum discoveries were made in 1983, as follows: Barki-1, Bamboo-1, Toma-1, Hamra-1, Kanga-1, and Laloba-1, all in the Heglig area; and the Unity-14 and Unity-18 wells discovered on the upthrown side of boundary faults during appraisal drilling in the Bentiu area. Twelve delineation or development wells and 2 high-volume water source wells were drilled within the Unity and Heglig Oilfields, bringing the total of wells drilled for initial petroleum development to 22. Project plans called for an additional 36 wells to be drilled, which were required for the initial development program for the 2 fields. The fields were scheduled to begin production in late 1985.

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[1] Physical scientist, Division of Foreign Data.

The Mineral Industry of Sweden

By Joseph B. Huvos[1]

In 1983, Sweden's mineral industry remained small but technologically advanced. The country was one of the world's largest iron ore producers and a significant producer of nonferrous metals and industrial minerals. Hydroelectric and nuclear power were abundant, but fossil fuels had to be imported. Sweden's economy was riding the wave of an export-led upswing, the fruit of the krona devaluations in 1981 and 1982. Economic activity was further buttressed in 1983 by a world economic recovery. Sweden's gross national product (GNP) was about $91 billion,[2] an increase in real terms of 1.9%. Despite the improvement in trade performance, a heavy debt burden amounting to 13% of the GNP and a budget deficit of similar magnitude and a high level of unemployment remained problems to be solved.

The Swedish National Board of Economic Defense, which is said to administer the Swedish strategic stockpile of certain metals, minerals, and raw materials, has purchased 40 tons of nickel. Sweden's defense stockpile, initiated in 1930, was believed to include about 1 year's supply of chrome ore, cobalt, manganese ore, vanadium, and other unspecified mineral raw materials.

Significant developments in Sweden's mineral industry included a merger agreement in the stainless steel industry, the first year with a profit at Luossavaara Kiirunavaara AB (LKAB), termination of the first 5-year phase of rationalizing Svenskt Stål AB (SSAB), the discovery of uranium and nonferrous metal deposits, improvement in saving oil, and the construction of the Danish-Swedish natural gas pipeline.

Exploration.—The level of prospecting at Boliden AB, Sweden's major privately owned metal producer, remained high. The company invested about $8 million in prospecting and related activities. Exploratory work and test mining was begun at the Holmtjärn deposit about 50 kilometers west of Boliden, and was to continue through 1984. An agreement was reached between Boliden and the Swedish Board for Mining Properties covering a joint effort to increase the ore base at the Stekenjokk Mine, to ensure a more extended operation. Exploratory work was to take 3 to 4 years.

Explorations of the Dammsjö deposit in the Garpenberg area were completed. Decision on the deposit may be taken in 1984, and would be subject to terms imposed by the Swedish Franchise Board for Environmental Protection. A comprehensive program of depth prospecting was begun in 1983 in the Skelleftea Field to ensure the long-term supply of ore to the ore dressing plants in Boliden and Kristineberg.

Attractive mineralizations containing copper, silver, and zinc were discovered in Junsele in northwestern Ångermanland. The Skelleftea-type mineralization makes it very likely that mining operations are to be established here. Boliden concluded an agreement with Norsk Hydro A/S covering prospecting in the Lumsvik area of Gävleborg County. Interest in the area was due to the presence of apatite deposits.

PRODUCTION

Indices of Swedish mineral industry production in 1982 and 1983 are shown in the following tabulation (1980=100):

Industry sector	1982	1983[p]
Iron ore mining	56	46
Nonmetallic minerals	85	83
Iron and steel and other metals	99	107
Mining, quarrying, manufacturing	97	102

[p]Preliminary.

Source: Monthly Digest of Swedish Statistics, No. 3, 1984, p. 13.

Table 1.—Sweden: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum, unalloyed:					
Primary	81,955	81,641	82,717	78,898	82,324
Secondary	28,787	23,239	24,730	26,903	27,000
Arsenic: White, refined[e]	5,080	4,080	4,000	4,000	4,000
Copper:					
Mine output, metal content	45,773	42,785	50,700	54,891	[3]64,478
Metal:					
Smelter:					
Primary	51,655	45,749	60,576	72,504	[3]78,756
Secondary	12,889	10,692	13,259	17,397	[3]23,076
Total	64,544	56,441	73,835	89,901	[3]101,832
Refined:					
Primary	43,733	43,164	50,142	50,304	[3]51,357
Secondary	15,243	12,549	11,750	[e]12,000	12,000
Total	58,976	55,713	61,892	62,304	[3]63,357
Gold:					
Mine output, metal content troy ounces	[e]70,000	[e]70,000	[e]70,000	77,160	[3]102,880
Metal including alloys do.	149,629	143,424	131,143	144,676	[3]205,766
Iron and steel:					
Iron ore and concentrate, gross weight:					
Direct-shipping ore thousand tons	15,696	14,300	[e]14,300	[e]9,000	7,000
Concentrate do.	10,473	[e]12,884	[e]8,925	[e]7,138	[3]6,212
Total do.	26,169	27,184	23,225	16,138	[3]13,212
Metal content of total do.	16,982	17,643	15,073	10,490	[3]8,588
Metal:					
Pig iron and sponge iron do.	3,033	2,436	1,720	1,877	[3]2,010
Electric-furnace ferroalloys:					
Ferrochromium	189,299	144,089	145,716	116,634	120,000
Ferrosilicochromium	28,825	8,335	2,525	1,906	1,900
Ferromolybdenum	1,365	805	726	552	600
Ferrosilicon	--	--	--	14,177	14,000
Ferrotungsten	500	423	377	365	300
Ferrovanadium	500	348	129	8	10
Silicon metal	12,929	18,457	14,340	[r] [e]16,000	16,000
Total	233,418	172,457	163,813	149,642	152,810
Steel, crude thousand tons	4,628	4,232	3,765	3,900	[3]4,210
Semimanufactures:					
Bars, rods, sections do.	1,241	1,190	1,159	1,106	1,100
Plates and sheets do.	1,046	1,202	1,139	1,271	1,200
Strip do.	147	734	665	782	700
Rails and accessories do.	52	49	38	--	--
Pipe and tube stock do.	170	178	150	44	50
Other including castings and forgings do.	675	216	82	168	200
Total do.	3,331	3,569	3,233	3,371	3,250
Lead:					
Mine output, metal content	81,626	72,200	84,100	80,800	[3]65,300

See footnotes at end of table.

Table 1.—Sweden: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS —Continued					
Lead —Continued					
Metal:					
Smelter, primary	[r]22,675	20,300	[r]7,000	29,600	[3]35,200
Refined:					
Primary	22,675	20,300	[r]7,000	29,600	[3]35,200
Secondary	[r]24,000	22,000	[r]22,000	19,900	[3]16,600
Total	[r]46,675	42,300	[r]29,000	49,500	[3]51,800
Selenium, elemental, refined	57	51	44	[e]44	44
Silver:					
Mine output, metal content thousand troy ounces	5,649	5,112	5,337	5,626	[3]5,491
Metal including alloys do.	9,473	7,666	6,825	7,966	[3]10,218
Tungsten, mine output, metal content	371	327	371	275	[3]330
Zinc, mine output, metal content	169,854	167,400	180,900	185,000	[3]203,200
NONMETALS					
Cement, hydraulic[4] thousand tons	2,387	2,445	2,318	2,302	[3]2,200
Chalk	35,822	33,739	34,376	34,110	[3]35,000
Clays: Kaolin	327	357	289	305	[3]300
Feldspar, salable, crude and ground	58,655	57,999	40,341	54,669	[3]55,000
Lime: Quicklime, hydrated lime, dead-burned dolomite thousand tons	776	744	642	[e]650	650
Nitrogen: N content of ammonia do.	89	86	79	77	[3]48
Phosphate rock (byproduct):					
Gross weight do.	58	88	124	131	[3]107
P_2O_5 content do.	23	34	48	50	[3]41
Pyrite and pyrrhotite (including cuprous), gross weight do.	448	396	419	426	[3]430
Sodium compounds:[e]					
Sodium carbonate	1,000	1,000	1,000	1,000	1,000
Sodium sulfate	105,000	105,000	105,000	105,000	105,000
Stone, sand and gravel:					
Dimension stone:					
Unworked:					
Limestone and marble thousand tons	20	22	27	26	NA
Granite and gneiss do.	67	92	115	111	NA
Quartz do.	16	6	5	5	NA
Quartzite do.	NA	NA	118	83	NA
Micaceous schist do.	17	17	17	15	NA
Sandstone do.	35	--	--	NA	NA
Other do.	17	14	11	4	NA
Worked, all types[5] do.	60	56	56	NA	NA
Crushed and broken stone:					
Clay slate do.	48	48	48	49	NA
Dolomite:					
Crude do.	354	[r]356	[r]412	453	NA
Burnt do.	17	7	7	8	NA
Granite and gneiss do.	8,807	8,666	9,212	10,000	NA
Limestone:					
For cement manufacture do.	2,222	1,840	1,352	1,181	NA
For lime manufacture do.	596	910	841	611	NA
For other industrial uses including lime marl do.	3,809	4,181	4,282	4,448	NA
Quartz do.	15	14	8	9	NA
Quartzite do.	91	61	115	99	NA
Sandstone do.	234	227	164	141	NA
Other do.	1,138	1,251	1,100	971	NA
Sulfur:					
S content of pyrite do.	282	249	202	204	[3]206
Byproduct:					
From metallurgy[e] do.	130	130	130	130	[3]130
From other sources do.	36	37	38	23	[3]30
Total do.	448	416	370	357	[3]366
Sulfuric acid do.	754	647	[r]825	813	400
Talc and steatite	17,746	15,856	15,581	17,753	15,000
Other, crude[6]	4,811	9,069	5,289	7,657	7,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	26,029	26,727	25,752	22,648	NA
Coal, all grades[e] thousand tons	9	9	--	--	--
Coke, metallurgical do.	1,136	1,186	1,101	1,158	NA
Oil shale, for fuel production use do.	3	--	--	--	--
Peat, for agricultural use do.	174	134	131	123	131

See footnotes at end of table.

Table 1.—Sweden: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
MINERAL FUELS AND RELATED MATERIALS — Continued					
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	20,944	23,146	20,128	19,592	[3]21,650
Jet fuel do	1,440	1,424	1,320	1,320	[3]1,968
Kerosine do	85	39	116	140	[3]163
Distillate fuel oil do	42,340	44,797	34,532	33,107	[3]34,823
Residual fuel oil do	48,335	55,122	35,718	31,715	[3]35,891
Lubricants do	168	266	329	[e]270	[3]300
Other:					
Liquefied petroleum gas do	1,160	1,102	940	1,030	[3]1,288
Naphtha do	1,113	1,003	1,802	1,360	[3]1,666
White spirit do	807	578	68	[e]42	
Asphalt and bitumen do	4,012	3,400	3,139	3,030	[3]5,212
Unspecified do	182	182	--	[e]749	
Refinery fuel and losses do	2,171	2,338	2,188	2,498	[3]2,033
Total do	122,757	133,397	100,280	94,853	104,994

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1] Includes data available through Aug. 3, 1984.

[2] In addition to the commodities listed, cobalt, nickel (as nickel sulfate), and metallic titanium are also produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

[4] Includes clinker as follows, in thousand tons: 1979—1; 1980—nil; 1981—nil; 1982—nil and 1983—nil.

[5] Represents material for sale, not that produced.

[6] Includes strontium minerals, unspecified minerals, and fragments of ceramic materials.

TRADE

Oil price hikes and energy conservation measures had a great effect on decreasing oil consumption, and the volume index (1980=100) fell from 112 in 1974 to 70 in 1983. The United States was Sweden's fourth largest export market owing to the strength of the dollar. U.S. mineral exports to Sweden included mainly phosphates and petrol coke. U.S. mineral imports from Sweden included some steel and nonferrous metals.

Table 2.—Sweden: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Scrap	[r]2,345	2,446	--	West Germany 906; France 466.
Unwrought	37,754	35,221	--	Netherlands 16,410; Norway 6,518.
Semimanufactures	[r]45,541	49,920	653	United Kingdom 7,972; Denmark 7,192; Norway 5,773.
Cobalt: Metal including alloys, all forms	342	65	6	India 14; United Kingdom 6.
Copper:				
Ore and concentrate	21,902	45,193	--	Finland 39,943; U.S.S.R. 5,250.
Ash and residue containing copper	14,427	10,555	--	Belgium-Luxembourg 8,508.
Metal including alloys:				
Scrap	1,011	2,222	--	Finland 957; Denmark 668.
Unwrought	[r]36,775	56,984	89	Belgium-Luxembourg 23,670; United Kingdom 14,787.
Semimanufactures	73,179	70,822	9,986	Denmark 9,095; West Germany 8,387; Norway 7,933.
Gold:				
Waste and sweepings value, thousands	$14,000	$7,030	--	West Germany $5,686.
Metal including alloys, unwrought and partly wrought do	$68,234	$38,448	--	United Kingdom $740, unspecified $37,180.

See footnotes at end of table.

Table 2.—Sweden: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	17,709	12,597	64	West Germany 2,867; France 2,475; Belgium-Luxembourg 2,382.
Pyrite, roasted	305,648	56,543	--	West Germany 42,691.
Metal:				
Scrap	^{r}14,351	18,315	5	West Germany 10,057; Denmark 1,700.
Pig iron, cast iron, related materials	143,568	126,839	302	West Germany 18,133; United Kingdom 15,214.
Ferroalloys:				
Ferrochromium	^{r}105,676	80,351	NA	NA.
Ferromanganese	770	674	--	Finland 239; Turkey 168.
Ferromolybdenum	794	413	--	United Kingdom 105; Netherlands 96.
Ferrosilicochromium	182	1,037	--	West Germany 854.
Ferrosilicomanganese	80	16	--	All to Finland.
Ferrosilicon	15,160	6,533	NA	NA.
Unspecified	2,155	639	19	Finland 157; Czechoslovakia 127.
Steel, primary forms	^{r}302,525	354,098	146,436	West Germany 40,956; Portugal 30,578.
Semimanufactures:				
Bars, rods, angles, shapes, sections	^{r}416,737	712,575	29,739	West Germany 137,082; United Kingdom 80,753.
Universals, plates, sheets	608,571	746,234	75,985	West Germany 141,404; Denmark 99,094.
Hoop and strip	90,467	100,432	4,845	West Germany 20,764; Finland 13,866.
Rails and accessories	27,689	41,471	--	Norway 17,245; Italy 12,583.
Wire	62,839	62,197	5,578	West Germany 12,026; Finland 6,411.
Tubes, pipes, fittings	235,636	222,921	25,018	West Germany 38,036; France 21,519.
Castings and forgings, rough	2,388	2,105	3	Norway 522; Peru 481.
Lead:				
Ore and concentrate	^{r}91,258	49,246	--	West Germany 33,997; Belgium-Luxembourg 12,568.
Metal including alloys, unwrought	^{r}26,375	54,413	--	West Germany 24,669; Finland 9,509.
Manganese: Metal including alloys, all forms	79	68	--	Finland 35; Norway 15.
Mercury 76-pound flasks	261	290	--	West Germany 174; United Kingdom 58.
Molybdenum:				
Ore and concentrate	1,691	1,970	--	West Germany 1,160; Netherlands 373.
Metal including alloys, all forms	38	7	NA	NA.
Nickel: Metal including alloys:				
Scrap	^{r}525	573	--	West Germany 235; India 131.
Unwrought	1,397	823	--	Netherlands 660; United Kingdom 110.
Semimanufactures	^{r}1,413	1,195	205	Italy 238; France 218.
Silicon, high-purity value, thousands	^{r}\$16,206	\$14,259	NA	NA.
Silver: Metal including alloys, unwrought and partly wrought thousand troy ounces	6,334	5,819	NA	NA.
Tungsten: Ore and concentrate	691	404	--	India 171; Netherlands 110.
Zinc:				
Ore and concentrate	^{r}360,341	362,276	--	Finland 87,318; Norway 79,199.
Ash and residue containing zinc	28,965	30,007	--	Norway 28,848.
Metal including alloys:				
Scrap	^{r}3,707	3,543	--	Norway 2,276; West Germany 396.
Unwrought	1,113	900	--	Norway 682; Tanzania 124.
Other:				
Oxides and hydroxides	95	58	--	Finland 26; Netherlands 16.
Ashes and residues	4,916	955	--	West Germany 455.
Base metals including alloys, all forms	390	612	102	United Kingdom 253.
NONMETALS				
Abrasives, n.e.s.:				
Artificial:				
Corundum	173	50	17	Austria 27.
Silicon carbide	416	671	--	Norway 434; West Germany 228.

See footnotes at end of table.

Table 2.—Sweden: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Abrasives, n.e.s. —Continued				
Grinding and polishing wheels and stones	^{r}2,171	1,970	8	Finland 329; U.S.S.R. 309.
Cement	318,820	537,515	257	Nigeria 270,514; Egypt 233,016.
Chalk	^{r}10,705	8,830	--	Norway 3,426; Finland 2,920.
Fertilizer materials: Manufactured:				
Ammonia	^{r}390	337	--	Norway 330.
Nitrogenous	^{r}60,905	77,733	--	Belgium-Luxembourg 8,206; France 8,202.
Phosphatic	55,574	64,260	NA	NA.
Graphite, natural	^{r}2,225	135	57	United Kingdom 31; Italy 25.
Phosphates, crude	^{r}92,575	81,414	--	Norway 81,394.
Pyrite, unroasted	^{r}60,571	31,177	--	Egypt 31,000; Denmark 177.
Salt and brine	^{r}4,324	3,798	--	Denmark 2,280; Norway 569.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	1,260	8,859	--	United Kingdom 4,165; Finland 3,061.
Sulfate, manufactured	^{r}70,523	66,715	NA	NA.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	130,498	158,422	6	West Germany 53,089; Denmark 37,340.
Worked	^{r}12,185	13,265	--	Denmark 6,896; Norway 1,367.
Dolomite, chiefly refractory-grade	^{r}36,912	35,656	--	Saudi Arabia 8,447; Netherlands 7,965.
Limestone other than dimension	786,190	882,817	--	Finland 691,079; Denmark 124,209.
Quartz and quartzite	^{r}92,423	169,764	63	Norway 161,550.
Sand other than metal-bearing	145,971	124,949	--	Norway 63,127; Denmark 54,087.
Sulfur:				
Elemental: Crude including native and byproduct	22,888	1,310	--	Finland 1,304.
Dioxide	20,913	31,879	--	Finland 18,217; Norway 8,026.
Sulfuric acid	24,331	3,360	--	Norway 2,540.
Talc, steatite, soapstone, pyrophyllite	6,378	8,378	--	Netherlands 3,630; United Kingdom 3,226.
Other:				
Crude	^{r}10,881	10,576	--	Norway 4,562; United Kingdom 2,261.
Slag and dross, not metal-bearing	155,973	104,748	--	United Kingdom 50,974; Finland 20,783.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	11,125	10,722	--	Finland 3,558; Norway 2,464.
Coke and semicoke	^{r}232,836	220,310	--	Finland 205,122; Turkey 9,998.
Peat including briquets and litter	30,516	20,114	--	Denmark 11,368; Norway 5,123.
Petroleum:				
Crude thousand 42-gallon barrels	32	579	--	United Kingdom 578.
Refinery products do	29,317	35,005	439	Denmark 12,237; United Kingdom 4,844.

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^{r}Revised. NA Not available.

[1] Table prepared by Vanessa Paytes.

Table 3.—Sweden: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	40,967	49,838	2,512	Australia 32,329.
Oxides and hydroxides	215,498	204,581	340	Jamaica 105,940; West Germany 47,688.
Metal including alloys:				
Scrap	2,960	2,674	37	Norway 1,299.
Unwrought	38,687	45,479	--	Norway 31,183; U.S.S.R. 5,315.
Semimanufactures	60,763	69,987	4,577	West Germany 19,604; Norway 6,714.
Cadmium: Metal including alloys, all forms	186	224	--	Finland 98; Norway 76.
Chromium: Ore and concentrate	^{r}406,697	305,447	NA	NA.
Cobalt: Metal including alloys, all forms	555	273	18	Belgium-Luxembourg 106.
Copper:				
Ore and concentrate	89,062	96,844	--	Chile 41,825; Norway 23,282.
Matte and speiss including cement copper	10,830	8,516	--	France 8,458; Finland 58.
Ash and residue containing copper	5,794	12,173	7	West Germany 8,261; Italy 2,000.
Metal including alloys:				
Scrap	3,339	10,403	5,997	France 2,060; Norway 730.
Unwrought	65,781	77,471	291	Zambia 18,203; Belgium-Luxembourg 13,447; Chile 12,790.
Semimanufactures	30,466	28,483	275	West Germany 8,113; United Kingdom 5,365.
Gold:				
Waste and sweepings value, thousands	$838	$333	--	Finland $198; Denmark $71.
Metal including alloys, unwrought and partly wrought do.	$9,715	$8,009	$224	United Kingdom $5,354; West Germany $1,533.
Iron and steel:				
Iron ore and concentrate: Pyrite, roasted	--	34,774	--	Belgium-Luxembourg 34,750.
Metal:				
Scrap	246,431	529,074	38,733	U.S.S.R. 187,246; United Kingdom 162,077.
Pig iron, cast iron, related materials	46,402	67,615	73	U.S.S.R. 38,681; West Germany 6,512.
Ferroalloys:				
Ferrochromium	23,246	39,820	--	Republic of South Africa 22,724.
Ferromanganese	33,071	29,139	--	Norway 23,164.
Ferromolybdenum	1,199	1,243	22	Austria 367; Belgium-Luxembourg 266.
Ferronickel	12,210	9,619	--	New Caledonia 3,177; Indonesia 2,580.
Ferrosilicochromium	634	2,396	--	U.S.S.R. 1,382; Norway 910.
Ferrosilicomanganese	9,956	11,086	--	Norway 7,521; Republic of South Africa 3,565.
Ferrosilicon	^{r}24,186	21,782	9	Norway 17,843; U.S.S.R. 1,174.
Unspecified	^{r}3,047	3,668	152	U.S.S.R. 1,266; West Germany 515.
Steel, primary forms	143,831	166,919	2,323	West Germany 78,387; Finland 48,446.
Semimanufactures:				
Bars, rods, angles, shapes, sections	414,112	416,737	1,962	West Germany 100,311; United Kingdom 63,156.
Universals, plates, sheets	818,942	890,550	426	West Germany 294,753; Belgium-Luxembourg 147,427.
Hoop and strip	149,517	135,838	98	West Germany 58,428; Poland 20,625.
Rails and accessories	4,143	3,705	--	United Kingdom 1,819; West Germany 1,396.
Wire	25,920	25,517	122	Belgium-Luxembourg 5,922; West Germany 4,984.
Tubes, pipes, fittings	258,522	284,146	1,255	West Germany 71,257; Denmark 33,003.
Castings and forgings, rough	10,447	8,862	1	Poland 2,436; Norway 1,723.
Lead:				
Oxides	2,365	2,563	7	West Germany 1,689; East Germany 495.
Metal including alloys:				
Scrap	4,342	5,040	--	Denmark 1,829; Canada 1,475.
Unwrought	^{r}8,322	4,161	--	United Kingdom 3,211; Finland 430.
Semimanufactures	1,075	1,144	1	West Germany 992; Netherlands 98.
Magnesium: Metal including alloys, unwrought	1,603	1,382	148	Norway 1,186.
Molybdenum: Ore and concentrate	5,648	6,397	2,503	Chile 1,225; United Kingdom 907.

See footnotes at end of table.

Table 3.—Sweden: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Nickel:				
Matte and speiss	3,113	2,603	--	Australia 2,168; U.S.S.R. 435.
Metal including alloys:				
Scrap	2,092	2,903	331	United Kingdom 1,139.
Unwrought	8,031	10,862	3,667	Canada 1,471; United Kingdom 1,423.
Semimanufactures	1,252	1,289	149	United Kingdom 388; Australia 150.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$39,848	$36,002	$7,270	Switzerland $11,853; United Kingdom $8,079.
Silver:				
Waste and sweepings[2] do	$6,565	$7,632	$3,229	Finland $2,091.
Metal including alloys, unwrought and partly wrought thousand troy ounces	13,953	8,938	1,768	West Germany 3,408; France 2,347.
Titanium:				
Ore and concentrate	2,050	3,730	--	Australia 3,121.
Oxides	2,924	2,979	234	Norway 1,026; Finland 487.
Tungsten: Ore and concentrate	2,417	1,700	--	Australia 463; China 394.
Zinc:				
Oxides	1,209	1,134	--	Netherlands 381; Norway 277.
Blue powder	547	638	--	Norway 634.
Ash and residue containing zinc	6,485	12,815	--	West Germany 6,889; Italy 3,854.
Metal including alloys, unwrought	30,509	35,792	--	Finland 14,691; Norway 12,916; France 5,392.
Zirconium:				
Ore and concentrate	1,151	888	--	Republic of South Africa 719.
Metal including alloys, all forms	176	176	40	France 120.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	473	1,575	13	Iceland 1,196.
Artificial:				
Corundum	6,607	4,959	271	West Germany 3,089.
Silicon carbide	r3,675	4,252	12	Norway 3,758.
Grinding and polishing wheels and stones	2,985	2,821	135	Austria 886; West Germany 419.
Asbestos, crude	1,101	1.039	--	Canada 1,037.
Barite and witherite	4,567	5,440	321	West Germany 4,408.
Boron materials:				
Crude natural borates	r16,097	17,375	11,047	Netherlands 3,300; Turkey 3,028.
Oxides and acids	556	548	102	France 298.
Cement	152,708	225,996	227	Poland 97,889; East Germany 88,786.
Chalk	21,809	32,726	9	West Germany 15,056; Denmark 6,859.
Clays, crude:				
Bentonite	3,339	5,546	1,620	Italy 1,717; West Germany 1,215.
Kaolin	r283,761	297,476	29,901	United Kingdom 248,151.
Unspecified	36,884	34,451	7,786	United Kingdom 16,031.
Cryolite and chiolite	322	488	--	Denmark 288; Czechoslovakia 200.
Diamond:				
Gem, not set or strung value, thousands	$19,199	$21,176	$961	Belgium-Luxembourg $12,325; Israel $5,166.
Industrial do	$915	$635	--	Netherlands $186; Republic of South Africa $161.
Diatomite and other infusorial earth	3,363	3,039	561	Denmark 1,331; Iceland 442.
Feldspar, fluorspar, related materials:				
Fluorspar	12,822	12,837	--	Mexico 9,150; East Germany 2,004.
Unspecified	6,709	9,791	--	Norway 8,912.
Fertilizer materials: Manufactured:				
Ammonia	162,789	156,133	--	U.S.S.R. 50,081; Trinidad and Tobago 44,307.
Nitrogenous	400,423	481,612	1,137	Norway 382,013; Netherlands 8,925.
Potassic value, thousands	r$20,959	$21,737	$141	West Germany $9,533; East Germany $5,616.
Unspecified and mixed	r97,616	213,186	81	Norway 169,282.
Graphite, natural	504	534	22	West Germany 354; Norway 48.
Gypsum and plaster	272,343	304,057	106	Spain 188,302; East Germany 110,227.
Lime	4,414	4,461	--	West Germany 1,514; Denmark 1,410.
Magnesium compounds: Magnesite	21,767	22,213	83	Norway 3,625; Greece 3,435.
Mica: Crude including splittings and waste	335	422	5	Norway 184; France 78.
Nitrates, crude	3,041	12,200	--	All from Chile.
Phosphates, crude	618,932	678,932	124,814	Morocco 267,396; U.S.S.R. 264,272.
Phosphorus, elemental	34	45	--	All from West Germany.

See footnotes at end of table.

Table 3.—Sweden: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Pigments, mineral: Iron oxides and hydroxides, processed	6,156	6,210	47	West Germany 5,358.
Potassium salts, crude	1,026	1,323	--	West Germany 1,229; East Germany 94.
Pyrite, unroasted	21,578	85	20	West Germany 60.
Salt and brine thousand tons	1,056	947	(3)	Netherlands 263; West Germany 218.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	142,372	134,272	33,697	East Germany 33,190; France 25,947.
Sulfate, manufactured	[r]37,009	21,968	--	Belgium-Luxembourg 9,361; United Kingdom 4,202.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	6,044	6,636	--	Finland 2,360; Norway 1,801.
Worked	7,863	6,009	--	Italy 1,950; Portugal 1,655.
Dolomite, chiefly refractory-grade	115,933	125,900	1	United Kingdom 56,895; Norway 44,424.
Gravel and crushed rock	115,634	105,780	171	Norway 27,163; Italy 24,787.
Limestone other than dimension	62,937	28,796	--	Denmark 19,848.
Quartz and quartzite	34,420	45,231	19	Spain 43,534.
Sand other than metal-bearing	314,831	337,213	92	Denmark 152,816; Belgium-Luxembourg 143,174.
Sulfur:				
Elemental:				
Crude including native and byproduct	23,250	8,645	--	Poland 8,328.
Colloidal, precipitated, sublimed	4,515	2,012	--	West Germany 2,011.
Dioxide	6,325	5,211	--	Norway 5,207.
Sulfuric acid	45,026	6,643	--	Norway 5,047; East Germany 1,158.
Talc, steatite, soapstone, pyrophyllite	34,853	26,133	13	Finland 12,148; Norway 7,992.
Other:				
Crude	88,645	150,609	72	Norway 126,351; West Germany 21,016.
Slag and dross, not metal-bearing	33,176	26,514	10	Denmark 11,499; Netherlands 8,027.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	952	1,036	275	Trinidad and Tobago 537.
Carbon: Carbon black	5,862	7,372	306	West Germany 4,480; Netherlands 1,576.
Coal:				
Anthracite	[r]10,069	26,140	--	United Kingdom 23,041.
Bituminous thousand tons	[r]2,028	2,856	2,031	Poland 275; U.S.S.R. 196.
Briquets of anthracite and bituminous coal	97	86	--	All from West Germany.
Lignite including briquets	2,182	2,879	--	East Germany 2,864.
Coke and semicoke	237,255	196,256	4,652	United Kingdom 90,574; West Germany 35,827.
Peat including briquets and litter	45,139	75,681	--	Finland 71,057; U.S.S.R. 2,782.
Petroleum:				
Crude thousand 42-gallon barrels	[r]107,200	93,206	--	United Kingdom 25,488; Norway 19,959; Saudi Arabia 12,425.
Refinery products:				
Liquefied petroleum gas do	1,139	1,423	89	United Kingdom 910.
Gasoline:				
Aviation do	82	62	--	United Kingdom 34; Netherlands 26.
Motor do	18,225	21,241	187	United Kingdom 3,542; Netherlands 3,286.
Mineral jelly and wax do	127	156	1	West Germany 77; China 28.
Kerosine and jet fuel do	3,366	4,025	163	Netherlands 2,368; Algeria 523.
Distillate fuel oil do	24,738	30,917	1,296	U.S.S.R. 5,909; United Kingdom 5,693.
Lubricants do	2,150	1,682	53	United Kingdom 383; Netherlands 357.
Residual fuel oil do	28,160	27,763	2,576	U.S.S.R. 7,958; United Kingdom 4,571.
Bitumen and other residues value, thousands	$19,215	$18,458	$2,009	Finland $5,272; West Germany $4,627.
Bituminous mixtures 42-gallon barrels	23,501	23,604	2,945	France 10,060; West Germany 2,557.
Petroleum coke do	239,305	273,917	191,637	West Germany 32,478; United Kingdom 32,390.

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[r]Revised. NA Not available.

[1]Table prepared by Vanessa Paytes.

[2]May include other precious metals.

[3]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—After 2 years of recession, Gränges Aluminium AB was profitable again, and in the first half of 1983, showed a profit of $10 million. On the Baltic coast, the company's Sundsvall aluminum smelter was operated near capacity. Gränges Aluminium was a subsidiary of Gränges Engineering AB, itself a subsidiary of the Gränges-Electrolux Group since 1980. In addition to the smelter, Gränges Aluminium included the Avesta Jernverks AB remelting plant; an extrusion producer; the Korrugal Group, which produced roofing sheets; GA Packaging, which produced foils; and a forging factory. Gränges was in the process of purchasing from Norway's Årdal og Sunndal Verk A/S, a foil plant in Denmark, formerly known as ASV Flexible, to be called Odense Flexible.

Investments planned for the future included a new secondary smelter for remelting beer cans at its Finspång remelting plant. Plans to expand primary capacity of Sundsvall faced opposition from the local community, as the Söderberg electrodes, used because they were 30% less costly than the prebaked ones, were thought to contribute to environmental problems.

Copper.—Boliden, Sweden's largest complex sulfide ore producer, and Scandinavia's largest copper producer, received one-quarter of its revenues from copper and set a number of new production records. The total ore mined amounted to 14.6 million tons, and production of copper at the Skelleftehamn smelter exceeded 100,000 tons, of which 64,000 tons was anodes for the refinery and 40,000 was blister. Operations in the Svardsjö Mine, about 20 kilometers northeast of Falun in Dalecarlia were resumed. The ore from this mine was treated in the Saxberget ore-dressing plant. Boliden's largest mine was the Aitik opencast mine located near Kiruna in the far north. The 11 million tons of ore treated there yearly contained less than 0.4% copper. Stekenjokk, Boliden's second largest mine, located near the Norwegian border, mined a copper-zinc-silver ore with 0.3 gram per ton of gold and 40 grams of silver. Remaining reserves were only for 8 years. Ores from this area were treated at Boliden and Kristineberg. Several small mines, Långdal Långsele, Udden, and Renström, fed the Boliden processing plant. About 15 years' reserves were at the four existing mines. The Kristineberg mill supported five mines: Kristineberg, Näsliden, Hornträsk, Rävliden, and Rävlidmuran. Reserves were sufficient for 14 years.

Boliden's smelter at Rönnskär had two copper circuits, a conventional one and one that had a Kaldo smelting furnace. Blister capacity exceeded refining capacity, accounting for blister exports.

The Government-owned LKAB mining company operated its new Viscaria copper mine, located only 5 kilometers from LKAB's head office at Kiruna, at the mine's design rate of 1 million tons of ore producing 85,000 tons of 25% copper concentrate. Work started also on rebuilding the mine's concentrator in order to increase its capacity to 1.2 million tons of ore and 90,000 tons of concentrate.

Gold.—Boliden decided to develop the Enåsen gold deposit in the municipality of Ljusdal in Hälsingland. The open pit mine and dressing plant were to begin operations in the autumn of 1984, at a rate of 200,000 tons of ore per year. Annual production would be approximately 13,000 troy ounces of gold.

Iron Ore.—LKAB returned a profit in 1983. This resulted from a vigorous rationalization campaign that slashed capacity almost in half, to 15 million tons per year. Stocks of iron ore of 9.5 million tons were drawn down to 6 million tons. The work force was cut by 2,000; the Swedish Government gave a debt writeoff; the company's headquarters was moved to Luleå in northern Sweden; and a new rail contract was negotiated, cutting rail freight costs by up to two-thirds. Links with the Gränges iron ore mining company were severed, and LKAB withdrew from the joint sales organization, Malmexport.

LKAB has regained its previous 11% to 12% share of the European Economic Community (EEC) iron ore market with about 56% of deliveries going to Usinor, Peine-Salzgitter AG, British Steel Corp. (BSC), and other EEC steelmakers.

Sales of high-phosphorus iron ore decreased because of a shift in steelmaking technology. However, the low-phosphorus pellets made from high-phosphorus ore have offered LKAB an alternative sales outlet. Recently, pellet sales rose to 5.4 million tons mainly to the Far East, to Indonesia's Krakatau plant, the Qatar Steel Co., Saudi Arabia's new Hadeed plant, and Malaysia's Sabah and Kuala Trengganu plants. Sales of olivine pellets were also on the increase. BSC bought shipments for its Redcar and Ravenscraig blast furnaces, and Sweden's SSAB used 2 million tons.

In Swedish Lappland, LKAB operated the Kiruna and Malmberget Mines and pellet plants, but Svappavaara was mothballed. SSAB operated the Grängesberg and Dannemora iron ore mines in central Sweden, after the closure of its mines in Blötberg, Häksberg, and Stråssa. Grängesberg's capacity was 2 million tons of iron ore and 100,000 tons of apatite concentrate. Dannemora's capacity was 600,000 tons of iron ore.

Iron and Steel.—On January 1, 1978, SSAB was formed from the Domnarvet works of Stora Kopparbergs Bergslags AB, Norrbottens Jernverk AB, and Gränges Oxelösund Jernverk with the aim of creating a framework within which the companies could be restructured to restore profitability. In 1977, these companies had recorded losses of about $100 million before depreciation and interest. The period of restructuring was set for 5 years, and at its end, following investment of about $400 million and a reduction in the number of employees from 16,000 to 12,500, losses had been turned into a net gain. Current raw steel capacity was 3.1 million tons per year, most of the production going to SSAB's own rolling mills.

Domnarvet was founded 100 years ago for consolidating small central Swedish ironworks and has become a large integrated works with four blast furnaces and raw steel capacity of 1 million tons. In 1983, the blast furnaces had been closed down and the Kaldo steelmaking and ingot rolling had ceased. The medium section mill had also been closed down. After 1981, steelmaking was from scrap only and steel was cast continuously. Total investment for restructuring was at this point $200 million; this included refurbishing of the electric furnaces and bar and rod mills. The largest investment was in hot and cold rolling. Reduced raw steel capacity became 450,000 tons per year. The hot-strip mill had 2-million-ton-per-year capacity; therefore, slabs were brought in from Luleå and Oxelösund in addition to materials from the Domnarvet electric steelworks.

Stainless Steel.—After months of negotiations, Avesta, Uddeholm AB, Fagersta AB, and Sandvik AB announced that most of their raw stainless steel production would be amalgamated, and that their welded stainless tube operations were to be combined. Avesta and its parent companies of the Axel Johnson Group, Sweden's and one of the world's largest privately owned companies, was to become the dominant partner and to become one of the world's largest stainless steel producers.

Raw stainless steel production was to be concentrated at two companies, Avesta and Sandvik. The latter was to retain its existing melting shop and continuous-casting mill. Avesta was to acquire 93% of the Uddeholm plant of Nyby Uddeholm as well as Fagersta's cold-rolling strip mills at Langshyttan. Avesta and Sandvik were to set up two new joint companies. One was to take over Fagersta's raw steel and hot-rolling operations, while the other, owned 75% by Avesta and 25% Sandvik, was to take over all their Swedish stainless welded tube operations, as well as the West German Fagesta-Sandvik Rohr operations and the Netherland's Johnson Tube Co.

The new Avesta Group was to be owned 60% by its present owners, the Nordstjernan AB, and 17% by A. Johnson & Co. The remaining 23% of the share capital of $40 million was to be marketed through the Scandinaviska Enskildabanken. Payment to Uddeholm Fagersta was to be by convertible loan stock worth about $50 million.

The Government was to participate by writing down the value of loans by about $50 million, $25 million of which was on the basis of earlier agreements. The appearance of state subsidies caused problems because it could invite action by importing countries.

Extensive rationalization by the new management, the objective of the stainless steel merger, was to follow the restructuring of the industry. Fagersta would probably be the first melting shop to close, followed by either Degerfors (Nyby Uddeholm) or Avesta. Cold-strip cuts would affect a narrow mill at Avesta and at its Ingersoll-Johnson Group subsidiary in the United States. The enlarged Avesta is to produce steel at nine sites in Sweden and at three sites abroad before any potential cutbacks. Swedish stainless steel production in 1982 was 328,000 tons of raw steel and 261,000 tons in the first three-quarters of 1983, compared with 1974 output of 518,500 tons. The new Avesta company was to retain the name of Avesta Jernverks AB, while the tube company was to be called Avesta Sandvik Tube AB.

Kockums Gjuteri of Kallinge in Blekinge installed two additional production furnaces in addition to the existing five. The new units were of the Presspour type, with a 5-ton capacity, and were powered by 200-kilowatt inductors.

Zinc.—Boliden has won an order to supply 5,000 to 10,000 tons of zinc clinker dust to the world's first plasma recycling plant being built for Scandust AB in Landskrona, southern Sweden, where SKF Steel's Plasmadust process was to be used. The plant was designed to recover 35,000 tons of chrome, lead, molybdenum, nickel, zinc, and other metals from 70,000 tons per year of iron and steel baghouse dust and other raw materials to be supplied from the Federal Republic of Germany, Sweden, and the United Kingdom where negotiations were currently underway. SKF has invested $4 million in the plant, and full operation was scheduled for early 1985.

NONMETALS

Apatite.—Norsk Hydro and Boliden have formed a partnership to prospect for phosphate deposits in the Sundsvall District of central Sweden. Norsk Hydro has a 40% share in the venture.

Chalk.—Sweden's only producer of chalk whiting was the Swedish Whiting Co. Ltd., which has a pit at Kvärnby 7 kilometers east of Malmö. Capacity was 50,000 tons per year, and mining was in a conventional open pit. Processing was by the wet method, and a 70% slurry was transported to paper mills.

MINERAL FUELS

Sweden made further progress in lowering energy consumption and promoting switching away from oil. Oil consumption decreased further by 10%.

Total energy demand was about 47 million tons of oil equivalent. About 18 million tons of oil equivalent was imported. Coal imports amounted to 2 million tons of oil equivalent. Hydropower generated was 13 million tons of oil equivalent, and nuclear power, 9 million tons.

Coal.—A coal-fired energy complex was in the planning stage at Nynashamn outside Stockholm, with construction to begin in 1985. One and one-half million tons of imported coal was to be converted to 700,000 tons per year of fuel-grade methanol, 2.5 billion kilowatt hours of fuel gas and hot water for district heating. The Texaco Oil AB gasification process was to be used in the plant.

Natural Gas.—Agreement was reached in 1983 that Sweden's west coast would receive Danish natural gas, supplied through Halmstad, Skåne, in 1986 and 1987. The cost for laying the pipeline was put at $200 million. Capacity of the undersea line was 70 billion cubic feet per year. The gas was to be transmitted also to Trollhättan and Vänersborg through Göteborg. Extension of the U.S.S.R.-Finland natural gas pipeline to Sweden was at the present doubtful.

Petroleum.—Only insignificant quantities of crude oil were produced on Sweden's Gotland Island. Sweden remained an important consumer of petroleum products with six refineries operated by four companies, mostly on the west coast, in Göteborg and Nynashamn. New construction included a Foster Wheeler, 20,000-barrel-per-day catalytic-cracking unit, and a Merox treater at Scandinaviska Raffinaderi AB's Lysekil refinery; energy conservation was also being studied at the same plant.

Uranium.—The Swedish Nuclear Fuel Supply Co. Ltd., Svensk Kärnbränsleförsorjning AB (SKBF), has prospected for uranium in Sweden for many years. A deposit at Lilljuthätten in Jämtland has been discovered where at least 2,300 tons of ore with over 1,000 grams per ton of uranium was found. Another promising mineralized area was found at Kvarnan, Boden community, Norrbotten. SKBF now holds 37 exploration concessions.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Swedish krona (SKr) to U.S. dollars at the rate of SKr7.67 = US$1.00 for 1983.

The Mineral Industry of Switzerland

By Roman V. Sondermayer[1]

During 1983, Switzerland continued to have few active mineral deposits. Domestic mineral production was limited to construction materials and salt. In addition, Switzerland processed imported crude oil, alumina, and raw materials for production of steel. Importance of the mineral industry to the domestic and world economy was modest. Approximately 2% of the gross national product could be attributed to the mineral economy and about 1.5% of the total labor force was employed in the mineral industry and its processing sector. Except for some exploratory drilling for hydrocarbons, reports indicated a quiet year for the mineral industry.

PRODUCTION

Except for a Government monopoly that produced salt, the mineral industry of Switzerland was privately owned. The major producers of minerals and related products were for aluminum, Schweizerisches Aluminium A.G.; for cement, Vigier Cement Ltd.; for petroleum refinery products, La Raffinerie du Sud S.A. and La Raffinerie de Cressier S.A.; and for steel, Ferrowohlen A.G.; Monteforno, Acciaierie Laminatoi S.A.; and Von Roll Ltd.

Table 1.—Switzerland: Production of mineral commodities[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum metal, smelter, primary tons	82,974	86,302	82,202	75,256	[3]75,974
Iron and steel metal:					
Pig iron and blast furnace ferroalloys	30	[e]29	30	[e]35	30
Electric-furnace ferroalloys[e]	5	5	5	5	4
Steel, crude	886	[e]900	966	950	900
Semimanufactures[e]	720	750	700	720	700
NONMETALS					
Cement, hydraulic	3,934	4,252	4,348	4,099	4,140
Gypsum[e]	70	64	85	[r]75	75
Lime	70	64	57	46	45
Nitrogen: N content of ammonia	[e]45	[e]45	33	33	32
Salt	385	378	431	362	[3]306
Sodium compounds: Sodium carbonate[e]	45	45	46	45	45
Sulfur, byproduct, all sources tons	[e]3,000	3,262	3,364	2,965	[3]2,711
MINERAL FUELS AND RELATED MATERIALS					
Gas, manufactured million cubic feet	1,855	1,789	1,379	1,864	1,900

See footnotes at end of table.

Table 1.—Switzerland: Production of mineral commodities[1] —Continued

(Thousand metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum refinery products:					
Liquefied petroleum gas thousand 42-gallon barrels	1,229	1,199	1,092	1,297	[3]1,180
Gasoline, all kinds do	8,381	9,527	10,371	9,041	[3]9,624
Jet fuel do	1,664	1,793	1,851	1,814	[3]2,030
Kerosine do	39	44	46	41	[3]37
Distillate fuel oil do	14,696	15,527	13,201	12,800	[3]13,479
Residual fuel oil do	6,380	4,431	3,615	3,315	[3]4,547
Other refinery products do	906	798	768	756	[3]702
Refinery fuel and losses do	2,041	1,896	1,766	1,692	[3]1,265
Total do	35,336	35,215	32,710	30,756	[3]32,864

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through June 5, 1984.

[2]In addition to the commodities listed, a variety of crude construction materials (common clay, sand and gravel, and stone) is undoubtedly produced, but output is not reported, and available general information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

TRADE

Switzerland remained a net importer of minerals. Values of fuels were the highest among imported minerals.

Table 2.—Switzerland: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Alkali metals kilograms	684	2,190	25	Bulgaria 801; West Germany 211.
Aluminum:				
Oxides and hydroxides	301	320	10	West Germany 188; France 20.
Metal including alloys:				
Unwrought	44,982	52,981	1,243	Italy 24,319; West Germany 20,851.
Semimanufactures	68,353	75,388	997	France 14,647; West Germany 11,926; United Kingdom 7,483.
Antimony: Metal including alloys, all forms kilograms	1,548	10,917	NA	West Germany 10,716.
Beryllium: Metal including alloys, all forms do	26	170	97	West Germany 64.
Chromium: Oxides and hydroxides	11	9	2	West Germany 4; Austria 1.
Columbium and tantalum: Metal including alloys, all forms, tantalum kilograms	585	568	170	West Germany 192; France 63.
Copper:				
Sulfate	37	22	NA	France 13.
Metal including alloys:				
Scrap	11,458	13,259	36	West Germany 4,961; Hungary 1,837; Spain 1,782.
Unwrought	4,459	5,723	--	West Germany 3,956; Italy 1,007.
Semimanufactures	18,807	22,336	1,863	West Germany 8,887; France 3,132; Italy 1,719.
Gold: Metal including alloys, unwrought and partly wrought thousand troy ounces	24,843	25,717	NA	NA.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	222	2,772	--	West Germany 2,741.
Metal:				
Scrap	128,334	105,415	--	Italy 88,726; West Germany 9,230.
Pig iron, cast iron, related materials	2,281	1,262	--	West Germany 1,153.

See footnotes at end of table.

Table 2.—Switzerland: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Ferroalloys:				
Ferrosilicon	112	157	--	West Germany 91; Turkey 30.
Silicon metal	5,375	4,903	(2)	West Germany 4,712.
Unspecified	896	674	--	Turkey 407; Italy 103.
Steel, primary forms	9,503	12,718	--	West Germany 10,687; Italy 1,980.
Semimanufactures:				
Bars, rods, angles, shapes, sections	302,079	319,284	99	West Germany 224,643; Italy 46,015.
Universals, plates, sheets	35,277	56,095	100	West Germany 44,794; Austria 5,775.
Hoop and strip	20,274	23,266	15	Austria 10,652; West Germany 6,637.
Rails and accessories	2,417	1,786	13	Austria 1,136; Italy 234.
Wire	16,501	15,624	33	West Germany 7,544; France 5,025; Austria 716.
Tubes, pipes, fittings	178,540	164,934	210	West Germany 58,016; Netherlands 18,520; France 16,120.
Castings and forgings, rough	13,516	13,355	70	West Germany 6,009; France 2,694.
Lead: Metal including alloys:				
Scrap	7,311	6,725	NA	Italy 4,155; West Germany 497; Netherlands 463.
Unwrought	4,847	5,101	--	West Germany 2,379; Italy 1,763.
Semimanufactures	55	62	(2)	Austria 42; France 9; Italy 4.
Magnesium: Metal including alloys:				
Unwrought	84	198	--	West Germany 148; Austria 14.
Semimanufactures	283	316	14	Yugoslavia 88; France 78.
Manganese: Oxides	5	6	--	All to Sweden.
Mercury 76-pound flasks	135	93	--	West Germany 30; Algeria 17.
Molybdenum: Metal including alloys:				
Unwrought kilograms	4,261	762	NA	France 296; Austria 149.
Semimanufactures do	9,288	2,778	56	West Germany 1,237; Poland 486.
Nickel: Metal including alloys:				
Scrap	247	241	--	West Germany 211; Netherlands 17.
Unwrought	15	23	--	West Germany 6; Netherlands 5.
Semimanufactures	317	578	7	Argentina 253; West Germany 81; France 55.
Platinum-group metals: Metals including alloys, unwrought and partly wrought thousand troy ounces	940	798	19	Japan 264; Canada 126; West Germany 114.
Silver:				
Waste and sweepings[3] value, thousands	$197,927	$249,996	$147	Spain $203,435; West Germany $23,904.
Metal including alloys, unwrought and partly wrought thousand troy ounces	23,099	23,418	NA	NA.
Tin: Metal including alloys:				
Scrap	72	110	--	West Germany 89; France 21.
Unwrought	158	218	--	Denmark 50; Italy 43; West Germany 42.
Semimanufactures	38	33	--	France 10; Iraq 6.
Titanium: Oxides	82	76	(2)	Italy 21; Austria 15.
Tungsten: Metal including alloys:				
Unwrought	41	42	(2)	West Germany 19; United Kingdom 16.
Semimanufactures	8	26	(2)	West Germany 24.
Zinc:				
Oxides	3	24	--	Iran 18; West Germany 4.
Blue powder	44	25	--	West Germany 20.

See footnotes at end of table.

Table 2.—Switzerland: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Zinc —Continued				
Metal including alloys:				
Scrap	1,264	983	NA	Italy 585; West Germany 227; France 123.
Unwrought	9	12	--	Italy 10.
Semimanufactures	^{r}10	8	--	Austria 4; France 4.
Other:				
Ores and concentrates	562	309	--	Belgium-Luxembourg 125; West Germany 70; Portugal 53.
Oxides and hydroxides	369	230	1	West Germany 101; Italy 29.
Ashes and residues	17,056	15,353	--	West Germany 5,084; Belgium-Luxembourg 4,088; Italy 2,843.
Base metals including alloys, all forms	184	182	49	West Germany 78; France 9.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	62	108	(2)	Hong Kong 48.
Artificial:				
Corundum	146	194	4	West Germany 132; Algeria 16.
Silicon carbide	6,665	6,189	NA	NA.
Dust and powder of precious and semiprecious stones including diamond kilograms	2,910	2,981	192	Italy 916; France 372; Belgium-Luxembourg 328.
Grinding and polishing wheels and stones	1,309	1,396	5	United Kingdom 521; West Germany 209.
Asbestos, crude	164	348	--	Turkey 309; Austria 17.
Barite and witherite	22	12	--	West Germany 4; Mexico 3.
Boron materials:				
Crude natural borates	4	11	--	All to West Germany.
Oxides and acids	8	13	--	Austria 6; Algeria 1.
Cement	43,144	18,161	--	West Germany 17,953.
Chalk	2,859	2,634	--	France 2,389; West Germany 195.
Clays, crude	2,501	3,640	--	West Germany 3,257; France 140.
Cryolite and chiolite	23	9	--	India 4; Philippines 2.
Diamond:				
Gem, not set or strung value, thousands	$838,854	$689,258	$67,937	United Kingdom $157,693; Israel $130,823; Belgium-Luxembourg $92,243.
Industrial do	$43,395	$42,113	$1,111	Netherlands $14,417; Belgium-Luxembourg $4,816; France $4,805.
Diatomite and other infusorial earth	51	42	--	Yugoslavia 26; Austria 4.
Feldspar, fluorspar, related materials	183	129	--	Spain 59; Portugal 19.
Fertilizer materials:				
Crude, n.e.s	^{r}2,748	2,032	--	Austria 1,461; France 250.
Manufactured:				
Ammonia	150	85	(2)	Austria 81.
Nitrogenous	1,118	870	--	West Germany 580; Italy 176.
Phosphatic	13	24	--	All to Saudi Arabia.
Potassic	31	47	--	Italy 40; Iran 3.
Unspecified and mixed	2,876	2,867	(2)	West Germany 848; France 471; Ecuador 333.
Graphite, natural	25	9	--	Republic of Korea 4; West Germany 3.
Gypsum and plaster	5,647	13,992	--	France 13,869.
Lime	2,533	4,206	--	West Germany 3,538; France 523.
Magnesium compounds:				
Magnesite	8	24	--	West Germany 14; United Kingdom 4.
Oxides and hydroxides	1	4	--	United Kingdom 3.
Mica:				
Crude including splittings and waste	27	115	--	West Germany 95; Austria 10.
Worked including agglomerated splittings	561	466	1	India 65; France 61; Sweden 47; Hungary 43.
Phosphorus, elemental	19	31	--	Spain 20; France 9.

See footnotes at end of table.

Table 2.—Switzerland: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Pigments, mineral:				
Natural, crude	--	18	--	Austria 3; unspecified 12.
Iron oxides and hydroxides, processed	49	31	--	France 12; Austria 10.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$265,688	$248,219	$37,824	France $45,403; United Kingdom $32,558; West Germany $21,203.
Synthetic thousand carats	242,685	296,230	9,860	India 88,650; West Germany 55,990; France 45,485.
Salt and brine	278	698	--	France 667; West Germany 13.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	28,873	26,321	(²)	West Germany 14,162; Italy 12,137.
Sulfate, manufactured	3,024	1,024	NA	Italy 899; West Germany 63.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	32,594	30,455	--	West Germany 16,002; Italy 9,696.
Worked	13,777	10,115	(²)	West Germany 8,874; France 513.
Dolomite, chiefly refractory-grade	11	47	--	West Germany 37.
Gravel and crushed rock	26,532	16,365	--	West Germany 8,543; France 6,941.
Quartz and quartzite	33,877	32,107	--	Italy 30,317; West Germany 1,401.
Sand other than metal-bearing	15,414	14,111	--	France 7,349; Italy 4,804.
Sulfur:				
Elemental:				
Crude including native and byproduct	19	8,249	--	Italy 5,255; Yugoslavia 2,967.
Colloidal, precipitated, sublimed	8	5	--	France 1; West Germany 1.
Dioxide	454	358	7	Hungary 84; U.S.S.R. 60; Italy 35; Netherlands 34.
Sulfuric acid	20,678	17,628	1	West Germany 16,094; France 484.
Talc, steatite, soapstone, pyrophyllite	152	113	--	Austria 50; France 24.
Other:				
Crude	3,883	4,246	--	West Germany 2,124; Austria 1,660.
Slag and dross, not metal-bearing	11,262	30,575	--	West Germany 28,376; Italy 1,588.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	4	7	--	All to France.
Carbon: Carbon black	230	134	--	Czechoslovakia 65; France 19.
Coal: Bituminous	2	20	--	Iraq 9; West Germany 5.
Coke and semicoke	1,006	56	--	Austria 53.
Gas, manufactured	105	88	--	All to France.
Peat including briquets and litter	1,495	1,395	--	Austria 851; France 416.
Petroleum:				
Crude 42-gallon barrels	(²)	58	--	Libya 51.
Refinery products:				
Liquefied petroleum gas do.	124,770	172,399	12	Italy 127,414; France 24,998.
Gasoline, motor do.	38,675	1,768	--	Austria 1,071; West Germany 179.
Mineral jelly and wax do.	1,362	590	8	Greece 228; West Germany 71.
Kerosine and jet fuel do.	528	178	8	West Germany 39; U.S.S.R. 23.
Distillate fuel oil do.	50,527	35,316	--	Austria 35,301.
Lubricants do.	62,944	74,018	945	West Germany 15,848; Italy 13,531.
Residual fuel oil do.	122,844	272,267	--	Austria 227,978; West Germany 32,068.
Bitumen and other residues do.	6,408	13,423	--	France 11,896; West Germany 1,303.
Bituminous mixtures do.	--	4,472	--	West Germany 1,309; Sweden 782.
Petroleum coke do.	99	352	55	Italy 149; France 132.

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[r] Revised. NA Not available.

[1] Table prepared by Jozef Plachy.

[2] Less than 1/2 unit.

[3] May include other precious metals.

Table 3.—Switzerland: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Alkali metals	494	643	8	West Germany 613; United Kingdom 21.
Aluminum:				
Ore and concentrate	772	379	NA	West Germany 112; United Kingdom 40.
Oxides and hydroxides	171,709	135,364	265	Australia 113,182; Italy 10,214; West Germany 6,572.
Metal including alloys:				
Unwrought	37,574	48,076	(2)	Iceland 15,998; Norway 8,360; Egypt 7,673.
Semimanufactures	47,482	47,723	405	West Germany 20,427; Belgium-Luxembourg 7,796; France 6,309.
Beryllium: Metal including alloys, all forms kilograms	^{r}3,815	423	180	West Germany 121.
Chromium: Oxides and hydroxides	498	439	2	West Germany 348; Italy 47.
Columbium and tantalum: Metal including alloys, all forms, tantalum kilograms	^{r}1,102	1,236	494	Austria 584; United Kingdom 59.
Copper:				
Ore and concentrate	14	4	--	All from Belgium-Luxembourg.
Sulfate	692	582	NA	Italy 168; France 120.
Metal including alloys:				
Scrap	3,762	3,695	61	West Germany 1,552; U.S.S.R. 550.
Unwrought	11,097	9,363	56	West Germany 4,350; Belgium-Luxembourg 2,292; Austria 1,143.
Semimanufactures	78,566	76,332	471	West Germany 32,835; France 11,047.
Gold: Metal including alloys, unwrought and partly wrought thousand troy ounces	26,392	32,715	NA	NA.
Iron and steel:				
Iron ore and concentrate including roasted pyrite	49,487	21,050	--	West Germany 9,332; Republic of South Africa 5,917; Italy 5,109.
Metal:				
Scrap	113,138	106,433	10	West Germany 93,414.
Pig iron, cast iron, related materials	83,452	81,041	1	West Germany 36,347; France 23,364.
Ferroalloys:				
Ferrosilicon	5,538	4,726	--	France 2,015; Norway 1,186.
Silicon metal	22	273	8	Norway 141; West Germany 87.
Unspecified	11,475	11,950	71	Norway 4,750; West Germany 2,213.
Steel, primary forms	130,044	113,453	5	West Germany 45,702; Bulgaria 17,576.
Semimanufactures:				
Bars, rods, angles, shapes, sections	593,527	481,493	400	West Germany 139,139; Italy 133,022.
Universals, plates, sheets	613,688	573,570	119	West Germany 190,437; Belgium-Luxembourg 80,570; France 69,684.
Hoop and strip	210,167	190,614	412	West Germany 102,350; France 39,762.
Rails and accessories	48,571	41,288	--	Austria 21,113; West Germany 15,540.
Wire	38,328	35,152	51	West Germany 12,075; Austria 6,438.
Tubes, pipes, fittings	150,927	128,582	206	West Germany 59,433; France 19,377.
Castings and forgings, rough	8,542	9,576	1	West Germany 4,642; France 1,596.
Lead:				
Oxides	163	155	--	West Germany 70; Mexico 61.
Metal including alloys:				
Scrap	91	33	--	France 26; West Germany 4.
Unwrought	10,155	12,867	201	United Kingdom 4,196; France 2,762; West Germany 2,341.
Semimanufactures	1,513	1,688	2	West Germany 1,576.

See footnotes at end of table.

Table 3.—Switzerland: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Magnesium: Metal including alloys:				
Unwrought and scrap	1,389	1,620	71	Norway 812; Italy 362.
Semimanufactures	47	44	3	United Kingdom 18; France 10.
Manganese: Oxides	562	783	--	Greece 498; Belgium-Luxembourg 176.
Mercury 76-pound flasks	635	879	7	West Germany 776; France 56.
Molybdenum: Metal including alloys:				
Unwrought	4	18	--	Netherlands 10; West Germany 5.
Semimanufactures	16	11	(2)	Austria 8; France 2.
Nickel:				
Matte and speiss	1,164	1,034	28	Finland 192; Republic of South Africa 145; West Germany 126.
Metal including alloys:				
Scrap	240	242	--	Austria 136; United Kingdom 32.
Semimanufactures	1,152	940	95	West Germany 551; United Kingdom 152.
Platinum-group metals: Metals including alloys, unwrought and partly wrought thousand troy ounces	847	980	134	United Kingdom 223; Netherlands 218; U.S.S.R. 143.
Rare-earth metals including alloys, all forms kilograms	941	2,159	26	Australia 902; France 845.
Silver:				
Waste and sweepings[3] value, thousands	$92,184	$69,601	$6,838	Spain $17,375; Saudi Arabia $14,467; West Germany $7,164.
Metal including alloys, unwrought and partly wrought thousand troy ounces	28,973	37,401	NA	NA.
Tin: Metal including alloys:				
Unwrought	926	866	--	Indonesia 315; Thailand 211; Malaysia 141.
Semimanufactures	279	278	(2)	West Germany 160; France 68.
Titanium: Oxides	1,826	2,020	(2)	West Germany 949; United Kingdom 503.
Tungsten: Metal including alloys:				
Unwrought	66	28	1	France 11; Italy 7.
Semimanufactures	13	12	1	West Germany 4; Austria 3; France 1.
Zinc:				
Oxides	2,451	1,606	17	France 797; West Germany 347.
Blue powder	3,247	3,047	--	Belgium-Luxembourg 1,088; Netherlands 708; France 626.
Metal including alloys:				
Scrap	1	41	--	All from West Germany.
Unwrought	21,316	18,243	1	West Germany 4,922; Netherlands 2,646; Norway 2,336.
Semimanufactures	1,011	1,096	60	West Germany 578; Belgium-Luxembourg 300.
Other:				
Ores and concentrates	5,604	4,417	1	Republic of South Africa 2,746; West Germany 559.
Oxides and hydroxides	1,315	1,332	2	West Germany 771; France 205.
Ashes and residues	439	348	NA	West Germany 265; France 41.
Base metals including alloys, all forms	925	703	73	Netherlands 204; Republic of South Africa 148.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	535	1,130	98	West Germany 586; Italy 422.
Artificial:				
Corundum	6,177	5,902	155	West Germany 2,960; Austria 1,986.

See footnotes at end of table.

Table 3.—Switzerland: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Abrasives, n.e.s. —Continued				
Artificial —Continued				
Silicon carbide	863	1,100	(2)	West Germany 759; Norway 203; Italy 48.
Dust and powder of precious and semiprecious stones including diamond kilograms	3,950	5,363	1,373	Iceland 2,902; France 701.
Grinding and polishing wheels and stones	1,716	1,848	76	West Germany 973; Italy 230.
Asbestos, crude	16,886	5,455	2	Canada 2,584; Republic of South Africa 1,171; Italy 1,073.
Barite and witherite	2,092	1,795	--	West Germany 1,052; France 650.
Boron materials:				
Crude natural borates	10,729	10,757	10,324	Netherlands 432.
Oxides and acids	365	410	2	France 206; U.S.S.R. 100.
Cement	246,301	224,550	66	Italy 110,849; West Germany 45,463; Austria 36,180.
Chalk	24,299	24,078	18	France 20,557; West Germany 1,323.
Clays, crude: Unspecified	183,161	178,324	1,120	West Germany 79,557; United Kingdom 54,998.
Cryolite and chiolite	292	180	--	All from Denmark.
Diamond:				
Gem, not set or strung value, thousands	$798,298	$721,537	$86,782	United Kingdom $368,061; Belgium-Luxembourg $78,059; Israel $41,424.
Industrial do	$37,689	$39,999	$4,523	Ireland $29,355.
Diatomite and other infusorial earth	11,169	12,067	185	Denmark 7,378; Spain 2,942.
Feldspar, fluorspar, related materials	9,754	7,883	--	West Germany 2,385; Italy 2,254.
Fertilizer materials:				
Crude, n.e.s	[r]15,619	17,124	1	France 12,328; West Germany 2,417.
Manufactured:				
Ammonia	18,166	15,315	(2)	Austria 10,195; France 4,783.
Nitrogenous	97,885	77,646	1,332	Austria 27,749; West Germany 20,593.
Phosphatic	125,954	115,418	826	France 73,711; Belgium-Luxembourg 36,867.
Potassic	85,990	86,356	--	France 61,862; West Germany 20,712.
Unspecified and mixed	123,784	134,669	15,146	France 51,409; West Germany 22,164.
Graphite, natural	149	167	4	West Germany 78; Italy 70.
Gypsum and plaster	72,902	66,242	11	West Germany 39,489; France 15,429.
Lime	51,030	61,147	(2)	Italy 36,827; West Germany 24,183.
Magnesium compounds:				
Magnesite	4,756	4,212	--	Austria 2,929; Spain 1,055.
Oxides and hydroxides	214	260	16	West Germany 65; France 23.
Meerschaum, amber, jet value, thousands	$35	$10	--	NA.
Mica:				
Crude including splittings and waste	655	682	1	France 410; West Germany 83.
Worked including agglomerated splittings	417	392	(2)	France 251; Belgium-Luxembourg 132.
Phosphates, crude	9,799	7,344	--	Morocco 5,219; Israel 1,035.
Phosphorus, elemental	3,157	2,876	160	U.S.S.R. 874; Italy 676; France 612.
Pigments, mineral:				
Natural, crude	416	436	--	West Germany 194; France 124.
Iron oxides and hydroxides, processed	2,572	2,548	3	West Germany 2,375.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$329,146	$271,494	$30,985	United Kingdom $28,040; West Germany $25,830; Hungary $22,952.
Synthetic thousand carats	128,225	128,305	17,080	France 67,930; West Germany 30,850.

See footnotes at end of table.

Table 3.—Switzerland: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Pyrite, unroasted	4,924	118	--	West Germany 61; Italy 46.
Salt and brine	1,755	1,775	1	France 1,521; West Germany 153; Belgium-Luxembourg 85.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	5,272	6,508	(2)	France 2,888; East Germany 2,314.
Sulfate, manufactured	16,886	15,515	--	West Germany 7,281; Austria 6,777.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	106	135	--	West Germany 67; France 31.
Worked do.	94	93	(2)	Italy 71; Austria 11.
Dolomite, chiefly refractory-grade do.	27	20	--	Italy 16; France 2.
Gravel and crushed rock do.	5,116	5,372	(2)	France 3,035; West Germany 1,406.
Limestone other than dimension do.	16	20	--	Italy 13; France 6.
Quartz and quartzite do.	37	27	(2)	Italy 20; West Germany 7.
Sand other than metal-bearing do.	1,202	1,209	(2)	Italy 491; France 327.
Sulfur:				
Elemental:				
Crude including native and byproduct	29,735	36,390	--	West Germany 36,315.
Colloidal, precipitated, sublimed	189	127	(2)	France 98; Italy 20.
Dioxide	318	492	(2)	West Germany 412; Austria 34.
Sulfuric acid	2,318	3,624	1	West Germany 3,287; Austria 182.
Talc, steatite, soapstone, pyrophyllite	13,255	12,684	(2)	Austria 7,937; Italy 1,985.
Other:				
Crude	76,216	89,089	613	West Germany 51,325; France 9,592.
Slag and dross, not metal-bearing	31,752	32,700	--	West Germany 20,071; France 10,352.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,105	2,074	102	Trinidad and Tobago 1,801.
Carbon: Carbon black	4,008	3,881	48	West Germany 2,243; Italy 533.
Coal: Anthracite and bituminous	862,858	471,399	203,544	West Germany 109,291; Republic of South Africa 83,267.
Coke and semicoke	102,162	78,236	--	West Germany 50,001; France 24,553.
Gas, natural million cubic feet	706	424	--	Netherlands 423.
Peat including briquets and litter	68,079	72,742	--	West Germany 56,204; U.S.S.R. 14,919.
Petroleum:				
Crude thousand 42-gallon barrels	23,340	27,219	--	Libya 7,348; Nigeria 5,938; United Arab Emirates 3,065.
Refinery products:				
Liquefied petroleum gas do.	11,095	9,918	(2)	West Germany 5,083; Netherlands 4,821.
Gasoline, motor do.	17,902	17,378	(2)	Belgium-Luxembourg 4,609; West Germany 3,859.
Mineral jelly and wax do.	100	94	1	West Germany 62; France 13.
Kerosine and jet fuel do.	435	397	(2)	Italy 164; France 96.
Distillate fuel oil do.	36,596	31,549	57	U.S.S.R. 17,014; Netherlands 4,880.
Lubricants do.	593	537	11	West Germany 148; Italy 85; Belgium-Luxembourg 79.
Residual fuel oil do.	2,943	2,109	7	West Germany 950; Netherlands 340.
Bitumen and other residues do.	1,607	1,223	--	France 583; West Germany 424.
Bituminous mixtures do.	65	58	7	West Germany 40; France 9.
Petroleum coke do.	521	743	628	West Germany 115.

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[r]Revised. NA Not available.

[1] Table prepared by Jozef Plachy.

[2] Less than 1/2 unit.

[3] May include other precious metals.

COMMODITY REVIEW

METALS

Imported alumina and domestic electricity produced in hydropower plants were used for production of aluminum in Switzerland. Smelters at Chippis, Steg, and Martigny were in production in 1983.

NONMETALS

Cement.—During 1983, 12 cement plants produced cement in the country. During 1982, the latest year for which complete data were available, the industry employed 1,430 persons; utilization of available capacity was only 77%. The energy consumption totaled 15,645 terajoules, coal accounted for 79.2%, fuel oil was 9.2%, natural gas was only 0.3%, electric power used was 9.8%, and other fuels were 1.5% of the total.

Gypsum.—The production and marketing of gypsum, as well as fabrication of gypsum products, was dominated by Gips-Union A.G. in 1983. Gips-Union commissioned a mortar production plant in Holderbank, claiming it was the most modern installation in the world.

MINERAL FUELS

The Federal Government takes care of energy supply, information, research and development, and Canton coordination, and Cantons enact and implement laws. In Switzerland most of the electricity was generated by hydropower plants, roughly 70% of the total; and nuclear powerplants produced 29%. The use of fossil fuels was minimal. Pollution from power generation was nonexistent, which was important in a land with highly developed tourism.

Development of the small Finsterwald Gasfield, the first in Switzerland, continued; production is expected to start in 1984. The exploration program continued in 1983, with Swiss Petrol S.A. and Brigitta Elwerater A.G. as the operators. The exploration was concentrated in the Swiss plateau and Alpine Ridge, which is similar geologically and tectonically to the region of southern Germany where oil and gas fields were found.

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[1] Physical scientist, Division of Foreign Data.

The Mineral Industry of Taiwan

By E. Chin[1]

Domestic mine output in Taiwan is limited to small quantities of fuels (coal, petroleum, and natural gas); industrial minerals (principally limestone, marble, dolomite, salt, and serpentine); and sporadically, some metallic ores of copper and iron. Except for construction aggregates, Taiwan is dependent on foreign raw materials; i.e., minerals and fuels. The value of Taiwan's mine production represents less than 1% of the value of the nation's industrial output.

Production of metal ingot from foreign ores is also parochial, and largely limited to iron and steel, ferroalloys, and copper. Most of the metal output is consumed locally for the production of manufactures for the export market. Only a small fraction of the country's metal production is exported as ingot, which is about 1% of the total value of exports, most of which is iron and steel.

Monthly employment in the mining and quarrying sector averaged 44,500 in 1983 compared with 32,900 for utilities; 378,900 for construction; and 1,840,000 for manufacturing. Monthly average working hours in the mining sector were 180 in 1983, down from 186 in 1982 and 190 in 1981. The average monthly earnings in the mining sector in 1983 were $367,[2] down from $398 in 1982. Monthly earnings in other sectors were utilities, $491; manufacturing, $317; and construction, $311.

Taiwan's gross national product (GNP) in 1983 was $49.8 billion at current prices. In constant 1976 prices, GNP was $29.3 billion compared with $28.0 billion in 1982, a real growth rate of 5%. Annual per capita GNP reached $2,673, one of the highest in Asia. Prices were stable throughout the year with no growth in the wholesale price index. Inflation in the consumer price index was less than 1% for the year.[3]

As part of Taiwan's current economic plan (1982-85), the Council for Economic Planning and Development issued basic policies for the industrial sector. Included in the policies and measures were the following:

1. Restraining the expansion of energy-intensive industries, such as aluminum, lead, and zinc refining, and encouraging joint ventures overseas; coordinating the development of the steel and copper industries with user industries; and promoting the development of downstream facilities for the petrochemical industry.
2. Consolidating planning in the exploration and development of mineral resources and assigning highest priority to minerals used as raw materials in basic industries.
3. Expanding economic cooperation with other countries and encouraging investment in the development of offshore resources to secure stable and long-term supplies of minerals and other raw materials.
4. Intensifying efforts to improve manufacturing equipment and energy-use technology.
5. Reviewing the effects of incentives, taxation, and credit opportunities to improve the climate for investment in industrial development.
6. Encouraging the development of vertically allied industries to enhance adaptability and international competitiveness.
7. Encouraging the merger of construction firms to achieve greater economies of scale, and the development of overseas construction projects by the larger firms and directing the industry to be more responsive to the needs of national economic development.

The Mining Research Center of the Industrial Technology and Research Institute cooperates with domestic companies in providing technical services and investment capital for the development of mineral deposits in Southeast Asia, Central and South America, North America, the Middle East, and Australia. Government assistance was designed to stimulate exports of mining technology and provide Taiwan with more direct access to strategic mineral resources such as iron, coal, oil, natural gas, and uranium. Since 1973, Taiwan has provided technical or financial assistance for the development of 45 mineral deposits in Australia, Canada, Colombia, Honduras, Indonesia, Malaysia, Oman, Paraguay, the Philippines, Thailand, the United Arab Emirates, and the United States.

Although Taiwan's economy grew in 1983 by close to 5%, fixed investment dropped nearly 4%. Eleven major companies experienced financial difficulties. Although manufactures of some consumer products and high-technology items grew by 20% to 40%, manufactures of other articles and goods had only very slight gains or serious declines. Mining continued its perennial slump and construction remained weak.

Environmental protection has become a major issue in Taiwan's economy. The import of pollution control equipment is duty-free and qualifies for tax deductions. Imposition of restraints on industry have been issued and polluters may be subject to severe penalties. Notably, two plants that have consistently violated air and water standards were forced to close—one was Taiwan's only copper smelting plant, which was state owned, and the other, a plant of a leading petrochemical firm. In addition, approval was denied for a proposed hydroelectric facility and a cement factory in eastern Taiwan because of potential environmental harm.[4]

PRODUCTION

Domestic mine production in Taiwan is of little consequence by world standards. In terms of output quantity, carbonate minerals—limestone, marble, and dolomite, in that order—dominate the mining sector. Production of metallic minerals is sporadic and include only small quantities of copper and iron. The bulk of mine output, in addition to carbonates and aggregates, are industrial minerals—asbestos, chiolite, clays, feldspar, gem stones, gypsum, mica, salt, serpentine, sulfur, and talc.

Because of high world prices, the value of mineral fuels output dominate Taiwan's small mining sector. There are small quantities of crude petroleum and natural gas produced from indigenous wells. After oil and gas, coal was the second most important mineral mined in 1983. The principal significance of domestic mineral fuels production was as a very small supplement to Taiwan's energy requirements.

The total value of production by the mining sector was distributed as follows, in million dollars: crude petroleum and natural gas, 227; coal, 143; and miscellaneous mining and quarrying, 64.

The bulk of Taiwan's industrial output of mineral-derived products is from imported materials. Domestic production of finished articles and semimanufactures is primarily for export markets. Metal production includes ingots and manufactures of aluminum, copper, and iron and steel. The value of total output by secondary and tertiary industries related to minerals and metals in 1983 was as follows, in million dollars: petroleum and coal products, 4,758; basic metals, 2,648; nonmetallic mineral products, 1,366; chemical materials and products, 1,243; and metal products, 610.

The total value of mining and manufacturing in Taiwan was estimated to be $51.9 billion. Input of the mining sector was only $432 million compared with $51.478 billion for manufacturing.[5]

Table 1.—Taiwan: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983[p]
METALS					
Aluminum:					
Alumina, gross weight[e]	[r]113,000	[r]128,000	[r]62,000	20,000	--
Metal, primary	56,218	63,549	30,532	10,120	--
Copper:					
Mine output, metal content[e]	[r]6,700	[r]1,900	[r]500	(2)	--
Metal, refined	15,305	19,495	53,230	47,377	37,960
Gold, primary troy ounces	14,243	13,278	[r]56,695	71,770	52,361
Iron and steel: Metal:					
Pig iron thousand tons	1,760	[r]1,685	[r]1,610	2,695	2,700
Ferroalloys:					
Ferromanganese	24,820	21,010	17,843	17,094	20,040
Ferrosilicomanganese	15,263	22,607	14,376	21,311	18,509
Ferrosilicon	[r]31,245	[r]28,390	[r]14,869	13,757	14,866
Steel, crude thousand tons	[r]3,186	3,417	3,143	4,078	5,017
Lead, refinery, secondary[e]	20,000	16,800	[r]30,000	35,000	35,000
Silver, primary troy ounces	85,383	95,073	[r]214,879	504,088	345,270
NONMETALS					
Asbestos	2,957	683	2,317	2,392	2,819
Cement, hydraulic thousand tons	11,897	14,062	14,342	13,432	14,810
Clays:					
Fire clay	48,539	48,048	34,879	35,577	36,926
Kaolin	[r]85,041	79,802	90,836	87,532	102,895
Feldspar	24,403	25,149	17,215	10,305	11,866
Gypsum:					
Precipitated	2,535	3,364	1,985	1,320	1,522
Other	--	4,706	4,054	725	1,500
Lime	177,165	199,305	142,615	109,458	104,494
Mica	1,148	338	85	44	311
Nitrogen: N content of ammonia	390,923	414,350	406,097	317,647	310,594
Pyrite, gross weight	536	150	[r]40	(2)	--
Salt, marine	366,355	722,425	351,330	262,103	74,188
Sodium compounds, n.e.s.:					
Caustic soda	429,654	410,800	372,996	358,736	295,349
Sodium carbonate (soda ash)	80,715	92,540	72,064	59,220	93,820
Stone:					
Dolomite thousand tons	530	489	359	261	228
Limestone do.	13,126	12,822	13,221	11,378	13,183
Marble[3] do.	1,976	2,839	3,269	3,155	3,412
Serpentine do.	51	103	118	119	116
Sulfur:					
S content of pyrite	286	80	[r]21	(2)	--
Byproduct, all sources	8,946	8,099	9,849	20,080	26,848
Total	9,232	8,179	[r]9,870	20,080	26,848
Talc	11,194	9,911	24,774	30,661	27,053
MINERAL FUELS AND RELATED MATERIALS					
Carbon: Carbon black	12,983	15,070	23,406	21,313	32,968
Coal, bituminous thousand tons	2,720	2,574	2,446	2,384	2,236
Coke do.	240	227	219	159	150
Gas, natural:					
Gross[e] million cubic feet	68,000	69,000	59,000	48,000	48,000
Marketed do.	60,759	60,329	53,042	43,526	43,689
Petroleum:					
Crude thousand 42-gallon barrels	1,451	1,330	1,150	874	847
Refinery products:					
Gasoline do.	12,560	13,086	13,008	14,154	17,422
Kerosine do.	79	--	--	98	86
Distillate fuel oil do.	20,643	22,418	20,769	19,792	21,898
Residual fuel oil do.	57,525	63,988	60,286	57,133	58,019
Lubricants do.	945	857	802	702	835
Asphalt do.	1,715	1,749	1,813	2,271	2,406
Other[4] do.	5,304	2,595	1,562	1,442	3,449
Refinery fuel, losses and not reported[e] [5] do.	7,760	8,225	24,201	25,000	27,000
Total do.	106,531	112,918	122,441	120,592	131,115

[e]Estimated. [p]Preliminary. [r]Revised.

[1] Table includes data available through June 1, 1984.

[2] Revised to zero.

[3] Incorrectly reported as thousand cubic meters in previous editions.

[4] Naphtha, solvent oil, and base oil.

[5] Includes liquefied petroleum gas and jet fuel.

TRADE

Taiwan's major trading partners in 1983 were Australia, Canada, the Federal Republic of Germany, Hong Kong, Japan, Kuwait, Malaysia, Saudi Arabia, and the United States. The volume of two-way trade totaled $45.4 billion—exports, $25.1 billion, and imports, $20.3 billion. The value of exports to the United States was $11.3 billion, followed by Japan, $2.5 billion; Hong Kong, $1.6 billion; the Federal Republic of Germany, $0.9 billion; Saudi Arabia, $0.8 billion; and Canada, $0.7 billion. Japan was Taiwan's major supplier of imports, providing $5.6 billion. Receipts from the United States were $4.7 billion; Saudi Arabia, $1.9 billion; Kuwait, $1.1 billion; Australia and the Federal Republic of Germany, each with $0.7 billion.

The value of imports of crude petroleum was estimated at $3.9 billion; followed by coal, $0.4 billion; metallic ores, $0.2 billion; and other minerals, $0.1 billion. Manufactures continued to dominate exports. The largest class was electrical machinery and appliances, accounting for 17.6% of the total value of exports, followed by clothing and footwear, 1.5%; textiles, 7.0%; plastics, 6.8%; transportation equipment, 4.9%; metal products, 4.6%; and basic metals, 3.0%.[6]

Table 2.—Taiwan: Exports and reexports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	1,365	4,498	--	Republic of Korea 3,890; Indonesia 430.
Metal including alloys, all forms	6,643	8,004	83	Hong Kong 3,473; Japan 2,163; Indonesia 913.
Columbium and tantalum: Metal including alloys, all forms, tantalum	455	11	6	Austria 2; Japan 2.
Copper:				
Matte and speiss including cement copper	14	135	3	Japan 111; Hong Kong 14.
Sulfate	34	98	--	Malaysia 36; Singapore 30; Philippines 22.
Metal including alloys:				
Scrap	2,860	8,911	(2)	Japan 8,830.
Unwrought	218	184	23	Japan 125.
Semimanufactures	2,641	4,689	250	Hong Kong 2,654; Singapore 694; Malaysia 493.
Gold: Metal including alloys, unwrought and partly wrought ___troy ounces	32	--		
Iron and steel: Metal:				
Scrap	128,251	402,215	--	Thailand 194,668; Republic of Korea 98,701; Indonesia 40,240.
Pig iron, cast iron, related materials	887	438	202	Indonesia 51; Australia 39; Hong Kong 29.
Ferroalloys	8,572	6,771	200	Indonesia 3,736; Japan 1,392.
Steel, primary forms	204,568	294,275	12	Philippines 95,487; Malaysia 72,499; Indonesia 44,250.
Semimanufactures:				
Bars, rods, angles, shapes, sections	551,282	829,388	7,665	Saudi Arabia 246,179; Hong Kong 183,483; Malaysia 117,659.
Universals, plates, sheets	209,784	478,315	4,763	Japan 245,483; Singapore 43,738; Hong Kong 33,631.
Hoop and strip	1,954	2,788	18	Indonesia 1,274; Hong Kong 798.
Rails and accessories	1,465	1,260	--	Malaysia 647; Indonesia 245; Thailand 237.
Wire	7,061	5,133	243	Indonesia 1,085; Saudi Arabia 1,043; Hong Kong 792.
Tubes, pipes, fittings	215,424	237,329	106,994	Saudi Arabia 53,833; Hong Kong 13,882.
Castings and forgings, rough	7,600	6,103	3,773	Indonesia 927; Japan 281; Hong Kong 180.

See footnotes at end of table.

Table 2.—Taiwan: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Lead: Metal including alloys, all forms	14,361	14,891	35	Republic of Korea 8,689; Japan 2,336; Thailand 1,260.
Magnesium: Metal including alloys, all forms	530	220	112	Netherlands 36; Israel 34.
Nickel: Metal including alloys:				
Scrap	947	1,198	(2)	Japan 1,032; India 151.
Unwrought and semimanufactures	81	56	2	Japan 32; India 16.
Platinum-group metals: Metal including alloys, unwrought and partly wrought troy ounces	--	96	--	All to United Kingdom.
Silicon, high-purity	20	(2)	--	Mainly to Mexico.
Silver:				
Ore and concentrate[3] value	$31,354	--		
Waste and sweepings[3] thousand troy ounces	1,167	2,991	(2)	Hong Kong 2,444; Japan 542.
Metal including alloys, unwrought and partly wrought troy ounces	(4)	4,855	--	Switzerland 4,823.
Tin: Metal including alloys, all forms	178	209	10	Hong Kong 131; Thailand 17.
Titanium: Oxides	107	234	--	Philippines 157; Hong Kong 52.
Tungsten: Metal including alloys, all forms	6	11	(2)	Japan 5; Mexico 3.
Uranium and/or thorium: Metal including alloys, all forms	4	17	8	West Germany 4; Italy 4.
Zinc:				
Oxides	1,747	1,809	18	Japan 1,167.
Blue powder	121	579	2	Japan 577.
Metal including alloys, all forms	757	1,021	12	Japan 452; Australia 254; Indonesia 220.
Other: Base metals including alloys, all forms	^{r}156	70	3	Hong Kong 39; France 8; Philippines 6.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	26	13	(2)	Hong Kong 7; Philippines 3.
Artificial: Corundum	132	383	--	Japan 352; Singapore 17.
Dust and powder of precious and semiprecious stones including diamond kilograms	--	900	900	
Grinding and polishing wheels and stones	2,350	2,088	329	Thailand 452; Singapore 310; Hong Kong 190.
Asbestos, crude	37	3	--	All to Indonesia.
Cement thousand tons	1,568	2,764	(2)	Hong Kong 883; Singapore 771; Bangladesh 326.
Clays, crude	287	494	--	Philippines 227; Hong Kong 104; Indonesia 67.
Diamond:				
Natural:				
Gem, not set or strung thousand carats	275	11,075	NA	Saudi Arabia 10,650; Switzerland 240.
Industrial do	780	310	220	Italy 90.
Synthetic: Gem, not set or strung do	^{r}70,045	46,170	13,225	United Kingdom 16,190; Singapore 10,540; Canada 5,320.
Diatomite and other infusorial earth	112	49	--	Hong Kong 20; Japan 18.
Feldspar, fluorspar, related materials	20	35	--	All to Hong Kong.
Fertilizer materials: Manufactured:				
Ammonia	275	339	--	Thailand 320.
Nitrogenous	600	12,000	--	All to Malawi.
Potassic	5,589	13,037	--	Japan 6,850; Republic of Korea 4,400.
Unspecified and mixed	256	175	--	Hong Kong 147.
Graphite, natural	502	352	--	Japan 270; Netherlands 68.
Gypsum and plaster	1,049	350	(2)	Mainly to Indonesia.
Lime	1,868	1,160	--	Nigeria 505; Hong Kong 455.
Magnesium compounds:				
Oxides and hydroxides	--	150	--	All to Indonesia.
Other	54	50	--	Do.
Meerschaum, amber, jet	22	45	1	Hong Kong 42.
Mica, all forms	138	51	--	Japan 19; Australia 17.
Phosphates, crude	16	--		

See footnotes at end of table.

Table 2.—Taiwan: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Pigments, mineral:				
Natural, crude	--	26	([2])	Mainly to Hong Kong.
Iron oxides and hydroxides, processed	106	203	--	Singapore 72; Thailand 61; Malaysia 33.
Precious and semiprecious stones other than diamond:				
Natural kilograms	36,019	36,385	8,678	Italy 11,411; Japan 4,199; Venezuela 1,663.
Synthetic do	16,746	28,327	20,149	Italy 3,746; Saudi Arabia 930.
Salt and brine	3,065	1,000	--	All to Nigeria.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	12	71	--	Thailand 40; Hong Kong 21.
Sulfate, manufactured	13,591	25,273	--	Japan 9,600; Indonesia 6,350; Singapore 2,700.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	7,358	7,400	667	Japan 5,221; Hong Kong 773.
Worked	26,553	40,715	3,737	Saudi Arabia 22,569; Japan 7,506.
Dolomite, chiefly refractory-grade	62,092	14,835	--	Japan 12,900; Philippines 1,200.
Gravel and crushed rock	365,033	406,784	--	Japan 406,408.
Limestone other than dimension	917	664	--	Malaysia 350; Hong Kong 200; Philippines 100.
Quartz and quartzite	--	239	--	Japan 200.
Sand other than metal-bearing	237,732	288,708	--	Japan 286,614.
Sulfur:				
Elemental:				
Crude including native and byproduct	817	1,553	18	Indonesia 982; Philippines 235; Thailand 220.
Colloidal, precipitated, sublimed	444	430	--	Indonesia 150; Malaysia 150.
Sulfuric acid	800	269	--	Hong Kong 102; Philippines 48; Australia 40.
Talc, steatite, soapstone, pyrophyllite	1,706	1,114	5	Republic of Korea 500; Indonesia 265; Thailand 180.
Other:				
Crude	2,207	2,211	69	Indonesia 707; Hong Kong 679; Japan 325.
Slag and dross, not metal-bearing	406	16,891	--	Japan 16,470.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	722	2,487	--	Indonesia 1,423; Thailand 850.
Coal: All grades including briquets	30	40	--	All to Philippines.
Coke and semicoke	10,281	10,435	--	Indonesia 5,602; Singapore 1,250; Thailand 1,050.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	91	--		
Gasoline do	17	([5])	--	All to Brunei.
Kerosine and jet fuel do	2,736	2,978	1,722	Kiribati 377; Philippines 196; Japan 187.
Distillate fuel oil do	6,394	7,129	2	NA.
Lubricants do	r462	274	99	Republic of Korea 90; Pakistan 32.
Bitumen and other residues do	3	--		

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rRevised. NA Not available.

[1] Table prepared by Audrey D. Wilkes.

[2] Less than 1/2 unit.

[3] May include other precious metals.

[4] Revised to zero.

[5] Unreported quantity valued at $776.

Table 3.—Taiwan: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	106,754	30,373	--	All from Malaysia.
Oxides and hydroxides	39,323	18,593	138	Australia 13,461; Japan 4,558.
Metal including alloys:				
Scrap	16,847	15,775	12,188	Australia 1,054; Japan 1,014.
Unwrought	47,752	88,569	3,614	Bahrain 24,841; Canada 18,213; Venezuela 7,793.
Semimanufactures	9,694	14,955	1,284	Japan 8,998; Australia 2,127.
Arsenic:				
Ore and concentrate	2	7	--	All from Hong Kong.
Oxides and acids	220	192	--	France 90; Belgium-Luxembourg 51; Republic of Korea 51.
Beryllium: Metal including alloys, all forms kilograms	12,961	(2)	--	All from Japan.
Chromium:				
Ore and concentrate	1,270	1,856	--	Philippines 1,154; Republic of South Africa 666.
Oxides and hydroxides	1,248	1,654	429	Japan 713; Italy 362.
Cobalt: Oxides and hydroxides	25	23	--	Belgium-Luxembourg 18.
Columbium and tantalum: Metal including alloys, all forms, tantalum kilograms	131	35	18	Japan 15.
Copper:				
Ore and concentrate	215,963	85,427	--	Canada 44,455; Philippines 22,125; Papua New Guinea 10,600.
Matte and speiss including cement copper	21	6	--	Mainly from Hong Kong.
Sulfate	300	287	12	Japan 275.
Metal including alloys:				
Scrap	32,984	23,367	17,469	Japan 2,258; Hong Kong 1,736; Singapore 547.
Unwrought	40,157	27,401	107	Zaire 11,439; Japan 8,038; Chile 5,815.
Semimanufactures	36,546	32,043	1,638	Japan 28,329.
Gold:				
Bullion troy ounces	444,676	337,692	--	United Kingdom 305,544; Switzerland 32,148.
Metal including alloys, unwrought and partly wrought thousand troy ounces	722	1,179	846	Japan 332.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	2,413	4,049	(3)	Australia 2,268; Brazil 1,583; Republic of South Africa 186.
Pyrite, roasted	55,079	21,014	--	Philippines 19,034.
Metal:				
Scrap	880,789	650,988	322,556	Hong Kong 186,931; Australia 83,320.
Pig iron, cast iron, related materials	188,129	148,325	339	Brazil 125,002; Australia 15,007.
Ferroalloys	3,424	5,466	82	Japan 3,158; Republic of South Africa 1,190.
Steel, primary forms	71,727	163,796	2	Brazil 66,906; Republic of Korea 37,267; Japan 19,931.
Semimanufactures:				
Bars, rods, angles, shapes, sections	282,804	147,022	71	Japan 139,981.
Universals, plates, sheets	1,731,779	1,240,526	23,793	Japan 796,797; Republic of Korea 130,067; Republic of South Africa 84,797.
Hoop and strip	25,471	25,292	1,331	Japan 20,318.
Rails and accessories	12,736	15,277	734	Japan 10,181; Republic of Korea 3,427.
Wire	10,631	11,684	434	Japan 8,671; Republic of Korea 1,889.
Tube, pipes, fittings	56,030	39,652	339	Japan 37,361.
Castings and forgings, rough	2,592	1,203	77	Japan 1,068.
Lead:				
Oxides	2,905	1,847	3	Australia 994; Mexico 705; Belgium-Luxembourg 122.
Metal including alloys:				
Scrap	38,796	35,142	13,246	Jordan 7,817; United Arab Emirates 3,280; Kuwait 2,722.
Unwrought	7,418	8,806	5	Australia 4,920; Japan 2,055; Peru 798.
Semimanufactures	136	41	8	Japan 20; West Germany 8; Hong Kong 4.

See footnotes at end of table.

Table 3.—Taiwan: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982 United States	Sources, 1982 Other (principal)
METALS —Continued				
Magnesium: Metal including alloys, all forms	267	501	120	France 192; Norway 170.
Manganese:				
Ore and concentrate	62,742	135,556	--	Republic of South Africa 69,955; Gabon 42,234; Australia 16,026.
Oxides	1,408	1,504	(3)	Japan 778; Singapore 360; Spain 11
Metal including alloys, all forms	21	16	1	United Kingdom 12.
Mercury 76-pound flasks	424	452	20	Japan 179; Belgium-Luxembourg 1 Spain 100.
Molybdenum: Metal including alloys, all forms	50	45	38	Japan 4.
Nickel:				
Matte and speiss	18	486	(3)	Mainly from Canada.
Metal including alloys:				
Scrap	79	155	58	Singapore 73; Hong Kong 14.
Unwrought	2,479	2,822	22	Canada 1,791; Republic of South Africa 282; Japan 175.
Semimanufactures	170	154	22	Australia 63; Japan 29.
Platinum-group metals:				
Ore and concentrate value	$34,310	$13,463	--	All from Japan.
Metals including alloys, unwrought and partly wrought thousand troy ounces	r114	96	2	Japan 70; West Germany 21.
Rare-earth metals including alloys, all forms	175	128	--	Japan 55; West Germany 41; Franc 32.
Selenium, elemental	6	6	--	Mainly from Japan.
Silicon, high-purity	1,055	926	97	Norway 422; Canada 138; France 10
Silver:				
Waste and sweepings[4] troy ounces	3,762	4,598	257	West Germany 2,251; Hong Kong 1,157; Japan 772.
Metal including alloys, unwrought and partly wrought thousand troy ounces	r703	850	88	Japan 526; West Germany 103; Hon Kong 91.
Tin:				
Oxides	16	2	1	Mainly from Japan.
Metal including alloys, all forms	1,559	1,346	49	Malaysia 538; Hong Kong 368; Sing pore 316.
Titanium: Oxides	14,627	16,434	1,852	Japan 8,313; West Germany 2,522; Australia 2,291.
Tungsten: Metal including alloys, all forms	35	30	1	Japan 26.
Uranium and/or thorium: Oxides and other compounds	72	181	167	Japan 12.
Zinc:				
Oxides	224	248	53	Japan 99; West Germany 59; Republic of Korea 17.
Blue powder	173	114	4	Japan 56; Norway 35; Netherlands 17.
Metal including alloys:				
Scrap	33,397	29,654	25,273	Japan 1,629; Canada 850; Australia 419.
Unwrought	43,394	45,424	111	Australia 21,605; Japan 9,042; Canada 5,143.
Semimanufactures	735	731	11	Japan 669.
Other:				
Ores and concentrates	18,036	19,203	69	Malaysia 10,396; Australia 8,531.
Ashes and residues	14,193	15,887	7,930	Australia 2,944; Malaysia 868; Japa 620.
Base metals including alloys, all forms	537	371	26	Japan 221; Republic of South Africa 47; West Germany 22.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	2,550	1,640	498	Japan 1,080.
Artificial: Corundum	5,521	6,957	133	Japan 4,540; India 914; Hong Kong 800.
Dust and powder of precious and semiprecious stones including diamond kilograms	373	347	301	United Kingdom 38.
Grinding and polishing wheels and stones	891	578	49	Japan 252; Italy 174; West Germany 54.

See footnotes at end of table.

Table 3.—Taiwan: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Asbestos, crude	30,121	30,020	2,822	Canada 14,029; Republic of South Africa 12,399.
Barite and witherite	3,035	600	--	All from Thailand.
Boron materials:				
Crude natural borates	1,435	1,026	52	Japan 561; Netherlands 413.
Oxides and acids	7,584	1,148	909	Italy 126.
Cement	14,078	2,561	--	Japan 1,644; Thailand 600.
Chalk	70	10	--	All from Spain.
Clays, crude:				
Bentonite	7,237	6,174	4,955	Japan 828; Australia 160.
Fire clay	1,592	541	36	Japan 465.
Kaolin	54,261	52,357	32,322	Malaysia 7,046; Hong Kong 5,290; Republic of Korea 4,000.
Unspecified	110,852	101,639	2,619	Hong Kong 49,891; Japan 34,374; India 11,700.
Cryolite and chiolite	5	72	--	Denmark 63.
Diamond:				
Natural:				
Gem, not set or strung thousand carats	5,645	285	(5)	Japan 245.
Industrial do	1,460	1,990	1,980	Republic of South Africa 5; Switzerland 5.
Synthetic:				
Gem, not set or strung do	70	10	--	All from France.
Industrial do	9,850	800	70	Japan 695.
Diatomite and other infusorial earth	3,733	2,743	1,323	Japan 1,327.
Feldspar, fluorspar, related materials	49,606	69,312	508	Japan 23,896; Republic of Korea 21,250; Thailand 16,510.
Fertilizer materials: Manufactured:				
Ammonia	15	28	22	Japan 3; West Germany 2.
Nitrogenous	126,201	38,160	1,000	Republic of Korea 18,218; Japan 10,832; Austria 5,000.
Potassic	247,244	138,206	14,813	Canada 64,039; Israel 28,384.
Unspecified and mixed	11,593	1,153	103	Japan 855; United Kingdom 51; Norway 39.
Graphite, natural	10,440	7,942	1	Republic of Korea 6,024; Japan 1,028.
Gypsum and plaster	360,966	312,893	351	Australia 98,114; Japan 72,600; Thailand 46,237.
Iodine	6	5	--	Japan 4.
Lime	31	47	--	All from Japan.
Magnesium compounds:				
Oxides and hydroxides	7,446	5,598	35	Japan 5,390.
Other	9,951	11,918	--	India 7,720; Malaysia 3,700.
Meerschaum, amber, jet	28	12	--	Japan 7; Hong Kong 3.
Mica:				
Crude including splittings and waste	292	257	--	Japan 125; Republic of Korea 50; India 30.
Worked including agglomerated splittings	143	127	1	Japan 120.
Phosphates, crude	314,016	288,081	41,900	Jordan 164,200; Israel 41,613; Morocco 14,450.
Phosphorus, elemental	544	521	270	Republic of South Africa 199.
Pigments, mineral:				
Natural, crude	58	16	15	Hong Kong 1.
Iron oxides and hydroxides, processed	9,242	9,773	24	Japan 7,220; West Germany 1,098.
Precious and semiprecious stones other than diamond:				
Natural	1,787	1,203	6	Republic of South Africa 397; Brazil 349; Canada 211.
Synthetic kilograms	24,226	15,642	1,954	Italy 8,590; Japan 2,502.
Salt and brine	481,271	382,147	3	Australia 382,070.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	17,772	33,879	32,738	Japan 1,123.
Sulfate, manufactured	120	106	2	Japan 103.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	25,789	23,639	4	Italy 6,634; India 6,378; Philippines 2,677.
Worked	285	258	8	Italy 122; Philippines 66.
Dolomite, chiefly refractory-grade	971	1,050	--	Japan 1,029.
Gravel and crushed rock	3,362	2,921	59	France 2,502.
Limestone other than dimension	4,444	3,543	--	All from Japan.
Quartz and quartzite	516	635	42	Belgium-Luxembourg 208; Japan 178.
Sand other than metal-bearing	10,519	5,070	308	Australia 3,531; Japan 1,008.

See footnotes at end of table.

Table 3.—Taiwan: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Sulfur:				
Elemental:				
Crude including native and by-product	75,887	25,358	--	All from Canada.
Colloidal, precipitated, sublimed	264,015	156,287	220	Canada 99,135; Japan 56,902.
Dioxide	22	26	--	All from Japan.
Sulfuric acid	43,311	27,286	55	Japan 27,228.
Talc, steatite, soapstone, pyrophyllite	4,694	6,356	666	Republic of Korea 2,421; India 1,570; Japan 827.
Vermiculite	605	594	--	Republic of South Africa 522; India 50.
Other:				
Crude	r99,226	112,651	252	Republic of Korea 98,417; Japan 7,166.
Slag and dross, not metal-bearing	12,083	16,088	370	Japan 15,293.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	101	37	34	Japan 3.
Carbon: Carbon black	9,677	5,074	781	Australia 3,323; Japan 474; West Germany 185.
Coal, all grades including briquets thousand tons	5,187	5,589	2,189	Australia 2,189; Republic of South Africa 778; Canada 432.
Coke and semicoke	70,699	46,325	--	All from Japan.
Peat including briquets and litter	60	31	--	Finland 19; New Zealand 12.
Petroleum:				
Crude thousand 42-gallon barrels	125,808	116,580	--	Saudi Arabia 59,047; Kuwait 36,695.
Refinery products:				
Liquefied petroleum gas do.	2,778	3,018	(3)	Saudi Arabia 2,192; Australia 696.
Mineral jelly and wax do.	77	75	1	Japan 45; Indonesia 17.
Distillate fuel oil do.	15,641	4,733	2,372	Kuwait 1,133; Saudi Arabia 470; Bahrain 407.
Lubricants do.	r444	441	140	Japan 237; Singapore 30.
Nonlubricating oils do.	48	88	30	Japan 40.
Bitumen and other residues do.	34	3	2	Japan 1.
Petroleum coke do.	207	154	143	Japan 9.

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[r] Revised.
[1] Table prepared by Audrey D. Wilkes.
[2] Unreported quantity valued at $3,829.
[3] Less than 1/2 unit.
[4] May include other precious metals.
[5] Unreported quantity valued at $76,176.

COMMODITY REVIEW

METALS

Metal ore mining in Taiwan is sporadic as well as insignificant for domestic requirements or by world standards. Output of primary metal is largely limited to copper and iron and steel, all of which require imported ore raw materials. Taiwan's large shipbreaking industry generates scrap metal supplementing the supply from primary metal production and imports of primary and secondary metal.

Aluminum.—Taiwan Aluminium Corp. (Talco) commissioned its 50,000-ton-per-year aluminum smelter (Kao-Hsiung II) in June 1980. In early 1981, Kao-Hsiung II was shut down because of its inefficiency and lack of pollution control. During 1981, Kao-Hsiung II operated at about 60% of installed capacity, and in 1982, at about 20% of capacity. During 1983, the smelter was idle throughout the year except for the production of 440 pounds in June. The high cost of energy was cited as the cause for closure of the plant, which was slated for sale. However, on October 13, a memorandum of understanding was reached between Talco and the Aluminum Co. of America (Alcoa), whereby the latter would lease Talco's facilities. The joint venture, approved by the Ministry of Economic Affairs, will produce aluminum ingot from imported Australian raw material. Within 5 years after production, Alcoa was to invest $50 million in a second joint venture, to be split 49% by Alcoa and 51% by local investors, which will assume Talco's processing operations. Alcoa was to provide management and technical expertise in the processing and manufacture of aluminum semimanufactures. Talco's fabrication plant was being expanded to an annual capacity of 83,000 tons of high-grade sheet, foil, and can stock.

Copper.—Taiwan Metal Mining Corp. (TMMCO) was also experiencing financial difficulties in the production of copper at its 50,000-ton-per-year smelter near Keelung. In 1982, output was at 95% of installed capacity, and by 1983, operating capacity was further decreased to 80%. The smelter, which uses imported concentrate, was reportedly losing $950 per ton of metal sold. TMMCO offered its smelter for sale, and three bids were reportedly tendered by a Japanese concern and by two U.S. companies.

Iron and Steel.—China Steel Corp. (CSC) operates the only integrated iron and steel facility in Taiwan. Completion of its 3.25-million-ton Kao-Hsiung complex was completed in early 1982. The remainder of Taiwan's annual steel capacity (4.25 million tons) is spread among some 200 mills. About 30 or 40 have equipment such as arc furnaces and rolling mills, but most simply melt scrap and produce bars and small steel sections at a rate of a few thousand tons per year.

CSC plans a second-stage expansion, increasing its capacity to 5.65 million tons per year. Invitation for bidding was expected to be issued in mid-1984 for a new integrated mill at Kao-Hsiung with a steel capacity of 2.4 million tons. The new mill plans call for a blast furnace, coking furnaces, sintering furnaces, converters, continuous-casting and hot-rolling equipment, power generators, and other facilities representing a contract value of $1.2 billion. CSC has set an eventual production capacity limit of 8 million tons per year, the maximum allowed by its space limitation at its compound in one corner of Kao-Hsiung Harbor.

Tang Eng Iron Works Co. Ltd. in 1983 commissioned its facilities at Kao-Hsiung for cold-rolled stainless steel coil. Slabs produced by Tang Eng are hot rolled by CSC and returned for cold rolling. Stainless steel production was to reach 50,000 tons per year and to be eventually increased to 100,000 tons per year.

Other Metals.—Taiwan recovers small quantities of gold and silver as byproducts in copper refining. Production of ferroalloys—ferromanganese, ferrosilicomanganese, and ferrosilicon—totaled about 53,000 tons. Domestic requirements for lead and zinc are supplied by imports of primary and secondary metal.

NONMETALS

Cement.—Taiwan's cement industry is comprised of 17 plants operated by 11 companies. Throughout 1983, the industry operated at about 95% of rated capacity. Cement is produced primarily for domestic requirements. However, production capacity exceeds domestic demand. The Council for Economic Planning and Development proposed that future development of the industry include (1) improving storage and transportation facilities to streamline domestic supply and demand, (2) locating new cement plants in the eastern part of Taiwan, the source of abundant reserves of limestone, (3) encouraging export of clinker as well as grinding operations in cooperation with overseas firms, and (4) replacing the use of oil with coal as fuel in kilns and raising energy efficiency.

Fertilizer Materials.—Taiwan's fertilizer industry is dominated by large Government-owned companies. The output value of fertilizers in 1983 was estimated at $252 million. Because fertilizer output was sufficient to meet domestic demand, fertilizer producers were to increase the production of ammonia and urea to meet the needs of other industries. In addition, depressed demand and excess capacity in the Far East dampened the export market for the industry.

Other Nonmetals.—Mine production of other minerals in Taiwan included limestone, principally for the cement industry; dolomite for iron and steel; and marble for decorative use. Mine output of clays and serpentine was each about 120,000 tons per year. Lesser quantities of talc, feldspar, and asbestos were produced. Salt was produced by evaporation ponds, and output varied with climatic conditions. Output of gem stones and mica was limited in quantity and quality.

MINERAL FUELS

Taiwan produced only small quantities of coal, petroleum, and natural gas in 1983. Domestic energy output from these sources and from hydroelectric generation provided less than 14% of the country's total energy supply. The bulk of the nation's energy source was from imports of crude oil, which constituted 60% of total supply followed by imports of coal, 13%. Petroleum refining accounted for about 42% of the commercial energy consumption, followed by electric power generation, 31%. Consumption by various industrial sectors were as follows, in percent: nonmetallic mineral products and metallic products, each 10; chemicals, 9; energy, 7; and mining, 1.

Because of Taiwan's dependence on foreign energy sources, the Government promotes energy conservation and development of new energy sources. These measures include waste heat recovery; improved energy-use efficiency; formulating efficiency standards; promoting and developing nuclear energy, solar systems, and biomass; and utilizing thermal-energy conversion from tides and waves.

In the early 1970's, the Government decided to turn to nuclear energy to alleviate Taiwan's heavy dependence on imported fuels. Currently, there are four nuclear power units in commercial operation. Taiwan's first nuclear generating facility, the two-unit, 1,200-megawatt Chinshan powerplant, began commercial service in 1978. The two-unit, 2,000-megawatt Kuosheng power station began commercial operations in 1982. A two-unit, 1,900-megawatt station was under construction at Maanshan. In addition, preliminary engineering work was in progress for a two-unit, 1,000-megawatt power station at Yanliao.[7]

The Ministry of Economic Affairs provides funding for domestic geologic surveying for uranium. In Sanhsia, Hsinshih, and Tahsi, uranium occurrences have been discovered in shale adjacent to coal seams. Further studies were planned to obtain a thorough evaluation to determine the economic value of uranium in these areas.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from New Taiwan dollars (NT$) to U.S. dollars at the rate of NT$39.13=US$1.00 in 1982 and NT$40.10=US$1.00 in 1983.

[3] American Institute in Taiwan. U.S. State Dep. Aitgram A-001, Jan. 11, 1984.

[4] Industry of Free China. Council for Economic Planning and Development. V. 59, No. 5, May 1983, pp. 21-35.

[5] Industry of Free China. V. 61, No. 1, Jan. 1984, pp. 114-121.

[6] Inspectorate General of Customs. Monthly Statistics of Trade (Taiwan). V. 12, Dec. 1983, 968 pp.

[7] Taiwan Power Co. 1983 Annual Report (Taipei). 40 pp.

The Mineral Industry of Thailand

By Gordon L. Kinney[1]

Despite an improving international economic environment, the sharp downward trend in Thai minerals production, first established in 1981, continued in 1983. As a result of both falling levels of production and stagnant commodity prices, the value of output (excluding gas and oil) fell 18.7% to $359 million from $442 million (revised) in 1982.[2]

Thailand was a major world producer of several minerals irrespective of the drop in overall production. It was the market economy countries' leading producer of tantalum, fourth in tin and fluorite, eighth in barite, and ninth in tungsten. Important amounts of antimony, cement, gypsum, limestone, lignite, manganese, marl, natural gas, and petroleum were also produced, mostly for domestic consumption. A total of 37 minerals were produced in commercial quantity, and 17 of these were exported during the year. Employment in the mineral sector totaled about 170,000 people in the mines and processing plants.

The startup of crude oil production and the gradual increase in natural gas output were highlights in the mineral fuel sector of the economy. Pessimism over the original shortfall of natural gas production in 1982 was being replaced with a gradual realization that despite a downward revision of reserves figures, there was still a substantial source of domestic energy available and that only the timetable for the gas-based industrial development was really affected by the natural gas reserves controversy.

The current gas flow, even though less than originally planned, still replaced 30% of the demand for imported fuel oil or 8% of total energy demand. It amounted to a reported saving of $247 million in foreign exchange for the year.

The mining sector was being looked on as one of the best areas for potential expansion in the Thai economy. The fifth national economic and social development plan set an annual growth rate for the mining sector of 13% over the 5-year period April 1981 through March 1986. This was to be double the planned growth rate of the economy as a whole. To back up the planned growth, a number of mineral survey and development programs were underway or planned.

A survey of the tin resources in the offshore areas has been underway for several years and was progressing according to schedule. Major discoveries here would mean hundreds of millions of dollars to the sagging tin industry.

The Department of Mineral Resources (DMR) has been conducting a systematic onshore search for the nonmetallic industrial minerals with emphasis on bauxite, clays, feldspar, marble, phosphate rock, and pyrrhotite.

Alternate energy sources were being searched for throughout the country. Radioactive minerals were being sought but the director of DMR was not too optimistic on the prospects. Lignite, on the other hand, was found in several new locations. A total of 82 million tons of proved new lignite reserves were announced, most of which were in Chiang Mai and Lamphun Provinces.

Geological surveying and mapping were being conducted over those areas with the highest mineral potential, supplementing the above three projects. The DMR was beginning an experimental potash mine with the help of British and French technical consultants. The deposit has 240 million tons[3] of carnallite, a low-grade potassium mineral not normally considered an ore for potash.

By far, DMR's most ambitious plan was an airborne geophysical survey of the entire country in order to develop a comprehensive mineral resource data base that would be available to domestic and foreign mining concerns. The $64 million survey would take 5 years to complete and include airborne magnitometer, high-sensitivity gamma-ray spectrometer, and two-frequency, very low-frequency, electromagnetic instrumentation. Fixed-wing aircraft were to cover 382,500 square kilometers at 1-kilometer and 2-kilometer line spacing. Helicopters were to be used to cover the remaining 131,500 square kilometers of mountainous terrain, and to do followup work on an extra 20,000 square kilometers on 400-meter line spacing. Six companies representing five different countries submitted bids for this project in 1983.

PRODUCTION

Overall nonfuel mineral production was down again. Production of tin, which accounts for about 75% of the country's mineral output value, fell by 24.7% in value. Of the other 14 minerals, which together with tin accounted for approximately 99% of the country's mineral output value, six—wolframite, scheelite, metallurgical- and acid-grade fluorite, barite, and lead—also decreased in value. The major minerals showing increased production included gypsum, limestone, antimony, lead concentrate, feldspar, kaolin, and columbite-tantalite.

In the fuels sector, natural gas production stood at 159 million cubic feet per day from Erawan Gasfield at yearend. A second gasfield, Baanpot, came on-line during the year at 15 million cubic feet per day. Condensate from the two fields totaled about 8,000 barrels per day, contributing an additional $88 million to the value of the natural gas production. Thailand's first commercial crude oil production began at Sirkit Oilfield in January and closed the year at a production rate of 10,500 barrels per day. At the current rate, the small oilfield will replace about $100 million worth of imported crude oil in 1984.

Table 1.—Thailand: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983[p]
METALS					
Antimony:					
Ore and concentrate:					
Gross weight	6,905	6,862	2,820	1,567	2,808
Metal content	2,935	2,916	1,199	666	1,193
Metal, smelter	101	22	36	28	13
Chromium: Chromite, gross weight	42	--	--	--	--
Columbium and tantalum ores and concentrates, gross weight:[2]					
Columbite	382	213	49	39	549
Tantalite	25	143			
Total	407	356	49	39	549
Stuverite (mixed columbite-tantalite)	231	301	44	10	275
Iron and steel:					
Iron ore:					
Gross weight	103,101	84,966	62,472	26,750	40,304
Iron content	56,706	46,731	34,360	14,713	22,167
Metal:					
Pig iron	30,224	17,738	10,310	6,338	159
Ferroalloys:					
Ferrosilicon	3,041	60	280	--	--
Ferromanganese	2,187	112	369	--	--
Steel:					
Crude	440,000	450,000	300,000	312,158	243,900
Semimanufactures (selected):					
Bars	NA	321,517	109,711	229,203	385,000
Galvanized iron sheets	85,000	129,342	151,620	126,890	123,679
Tinned plates	40,000	70,183	78,834	62,227	73,119

See footnotes at end of table.

Table 1.—Thailand: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983^{p}
METALS —Continued					
Lead:					
Mine output, metal content of 42.5% Pb concentrate	8,719	10,560	17,283	18,580	21,015
Metal: Ingot, secondary	756	1,667	548	929	2,552
Manganese ore:					
Chemical-grade, over 75% MnO_2	42	11	5	12	--
Battery-grade and chemical-grade, 75% MnO_2	^{r}7,168	^{r}3,996	5,205	3,398	4,804
Metallurgical-grade, 46% to 50% MnO_2	^{r}28,156	^{r}50,303	5,707	4,348	1,906
Total	35,366	54,310	10,917	7,758	6,710
Rare-earth metals:					
Monazite concentrate, gross weight	32	152	107	162	277
Xenotime	6	52	45	46	38
Tin:					
Mine output, metal content	33,962	33,685	31,474	26,109	19,943
Metal: Smelter, primary	33,058	34,689	32,636	25,479	18,467
Titanium: Ilmenite concentrate, gross weight	780	--	37	18	205
Tungsten concentrate:					
Gross weight	3,543	3,134	2,348	1,661	1,092
Metal content	1,826	1,615	1,209	855	562
Zinc: Smelter production	10	30	--	--	--
Zirconium ore and concentrate, gross weight	116	61	104	196	199
NONMETALS					
Barite	378,654	305,057	307,046	330,948	187,437
Cement, hydraulic thousand tons	5,255	5,337	6,263	6,609	7,263
Clays:					
Ball clay	1,766	1,557	1,856	2,200	4,960
Kaolin	42,769	19,934	14,086	17,846	36,350
Kaolinite (dickite)	1,320	5,020	7,450	--	--
Diatomite	3,418	1,982	128	80	425
Feldspar	26,428	24,158	24,243	19,326	47,908
Fluorspar:					
Crude mine output:					
High-grade	177,730	172,784	157,311	176,084	159,959
Low-grade	82,122	133,547	113,667	106,609	77,716
Total	259,852	306,331	270,978	282,693	237,675
Salable product:					
Acid-grade (beneficiated low-grade)	56,574	60,108	55,181	81.024	46,689
Metallurgical-grade	177,730	172,784	157,311	176,084	159,959
Total	234,304	232,892	212,492	257,108	206,648
Graphite	--	2,074	1,800	630	86
Gypsum	352,398	411,977	540,383	753,433	760,361
Phosphate rock, crude	4,542	5,570	2,610	4,265	5,158
Salt:					
Rock	11,000	16,744	11,000	11,100	5,679
Other^{e}	165,000	165,000	165,000	165,000	165,000
Sand, silica	157,076	171,000	76,330	82,820	116,094
Stone:					
Calcite	1,860	360	2,325	1,020	1,871
Dolomite	4,030	8,130	7,510	9,662	8,527
Limestone for cement manufacture only thousand tons	2,964	3,958	5,486	6,371	8,938
Marble	4,896	5,649	8,016	9,311	26,428
Marl for cement manufacture only thousand tons	2,262	1,939	1,787	458	--
Quartz, not further described	22,240	7,828	20	7,531	15,159
Shale for cement manufacture only thousand tons	748	801	1,124	1,248	1,200
Talc and related materials:					
Pyrophyllite	11,191	10,350	10,370	19,989	18,875
Talc	2,351	1,376	1,665	2,009	1,273
MINERAL FUELS AND RELATED MATERIALS					
Coal: Lignite thousand tons	1,356	1,427	1,686	1,964	1,866
Natural gas (gross production) million standard cubic feet	--	--	--	47,036	56,762

See footnotes at end of table.

Table 1.—Thailand: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983[p]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum:					
Crude ______ thousand 42-gallon barrels__	109	[e]110	[e]100	[3]3,832	[3]4,780
Refinery products:					
Gasoline ________________do____	14,535	11,511	11,558	12,366	13,365
Jet fuel ________________do____	5,720	4,948	5,941	5,648	6,275
Kerosine ________________do____	1,860	1,794	2,293	2,277	2,725
Distillate fuel oil ___________do____	16,860	17,551	17,331	17,879	19,198
Residual fuel oil ___________do____	19,980	16,180	17,018	15,201	13,591
Liquefied petroleum gas_______do____	1,450	1,536	1,730	1,255	1,434
Naphtha ________________do____	1,920	1,530	1,275	[e]1,300	[e]1,300
Asphalt_________________do____	1,121	727	854	[e]900	[e]900
Unspecified[e]______________do____	250	1,670	1,740	1,710	1,700
Refinery fuel and losses[e] ______do____	1,800				
Total ________________do____	65,496	57,447	59,740	58,536	60,488

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1] Includes data available through July 16, 1984.

[2] Excludes columbium- and tantalum-bearing tin slags, which make Thailand the world's largest source of newly mined tantalum.

[3] Includes natural gas condensate.

TRADE

The value of exports of minerals and mineral-based commodities, which accounted for 81% of production, fell to $291 million from the 1982 exports of $423 million (revised). Exports of tin accounted for about 80% of Thailand's mineral exports. There was, however, a decline in tin tonnage of 32% to 17,600 tons and in value by 34.3% to $228 million. Other leading mineral exports, tantalum-bearing tin slag, barite, acid-grade fluorite, and tungsten concentrates also decreased substantially in value. Running counter to the downward trend and increasing in value were gypsum, lead, tin-lead alloys, antimony, and metallurgical-grade fluorite.

As a result of the drop in mineral export values, the mineral sector dropped to fifth place among Thai trade commodities. Minerals occupied third place after rice and cassava as recently as 1979, but were surpassed by textiles and sugar.

Minerals reflected the generally poor performance of the country's trade sector in 1983. Exports were valued at $6.35 billion, a decline of 7.1%, the first decline since 1975. Imports increased 21.6% to $10.22 billion, yielding a record trade deficit of $3.87 billion.

Mineral imports were dominated by crude oil and refined petroleum products. Heavy fuel oil imports were slowly being replaced by natural gas as production from the offshore fields rose steadily. Fertilizers continued to be a major import item as no primary producers operated in Thailand. Aluminum, copper, steel, and zinc were imported in considerable quantities as there was no production of primary aluminum, copper, or zinc in the country and only a token amount of steel was produced from iron ore.

Table 2.—Thailand: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	859	1,337	--	Malaysia 303; India 296; Bangladesh 236.
Antimony:				
Ore and concentrate	5,268	2,796	171	Republic of Korea 1,308; Belgium-Luxembourg 784; Brazil 305.
Metal including alloys, all forms	16	--		
Columbium and tantalum: Ore and concentrate	203	93	3	West Germany 90.
Iron and steel: Metal:				
Scrap	1,373	7,817	5,741	Japan 1,570; United Kingdom 250.
Semimanufactures:				
Tubes, pipes, fittings	59,241	51,110	582	Singapore 11,667; Bangladesh 11,451; Hong Kong 7,699.
Unspecified	755	2,682	--	Laos 2,292; Singapore 270.
Lead: Ore and concentrate	37,520	37,636	--	Netherlands 17,500; Japan 10,200; Italy 4,200.
Manganese: Ore and concentrate, metallurgical-grade	16,900	2,000	--	All to Taiwan.
Silver: Metal including alloys, unwrought and partly wrought thousand troy ounces	1,010	2,007	1,656	Belgium-Luxembourg 178; France 116.
Tin:				
Ore and concentrate	1,212	697	--	Netherlands 575; Japan 122.
Metal including alloys:				
Unwrought	30,278	25,542	9,775	Netherlands 10,379; Japan 4,340; Singapore 541.
Semimanufactures kilograms	--	50	--	All to Japan.
Tungsten: Ore and concentrate	1,993	1,462	181	Netherlands 523; West Germany 345; Sweden 229.
Zinc:				
Ore and concentrate	41	1	--	All to Belgium-Luxembourg.
Oxides	31	30	--	Sri Lanka 25; Singapore 5.
Blue powder	--	105	--	All to Japan.
Metal including alloys:				
Scrap	--	15	--	All to India.
Semimanufactures	369	997	--	Laos 860; Indonesia 69.
Other:				
Ores and concentrates	107	--		
Ashes and residues	2,093	2,525	2,444	West Germany 46; Singapore 33.
Base metals including alloys, all forms	79	83	1	Netherlands 27; France 15; Republic of Korea 15.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	278	17	1	Burma 14.
Barite and witherite	234,091	287,888	99,319	Indonesia 86,067; Saudi Arabia 41,500; Singapore 20,806.
Cement	[r]84,217	254,357	--	Malaysia 146,936; Singapore 27,813; Bangladesh 26,917.
Chalk kilograms	28,285	40	--	All to Laos.
Clays, crude:				
Kaolin	515	136	--	Taiwan 101; Singapore 18; Malaysia 17.
Unspecified	90	53	(2)	Singapore 36; Malaysia 12.
Diamond:				
Gem, not set or strung carats	[r]22,366	61,554	42	Switzerland 34,805; Hong Kong 12,674; Belgium-Luxembourg 8,619.
Industrial do	--	1,130	--	All to Hong Kong.
Unsorted do	100	2,879	--	Hong Kong 2,858.
Feldspar	2,792	3,707	(2)	Singapore 1,584; Malaysia 1,408; Indonesia 500.
Fluorspar	221,838	182,388	--	U.S.S.R. 65,600; Japan 65,032; Republic of Korea 24,660.
Gypsum and plaster	216,625	377,148	--	Malaysia 124,258; Indonesia 93,150; Taiwan 57,635.
Precious and semiprecious stones other than diamond:				
Natural:				
Precious thousand carats	27,492	21,366	4,003	West Germany 4,877; Switzerland 3,424; Hong Kong 1,565.
Semiprecious kilograms	120,391	140,154	2,683	Hong Kong 135,805; France 403; West Germany 398.
Synthetic do	49	54	7	Republic of Korea 20; Switzerland 11; United Kingdom 5.

See footnotes at end of table.

Table 2.—Thailand: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Salt and brine	101,482	65,109	--	Malaysia 47,202; Singapore 17,748.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	--	110	--	Taiwan 75; Singapore 30.
Worked	154	475	4	Burma 238; Laos 108; Taiwan 87.
Dolomite, chiefly refractory-grade	3,268	5,160	--	All to Singapore.
Limestone other than dimension	2,566	2,713	(2)	Singapore 2,020; Malaysia 660.
Quartz and quartzite	5,368	12,759	--	Japan 10,701; Singapore 2,058.
Talc, steatite, soapstone, pyrophyllite	2,384	3,511	--	Sri Lanka 2,500; Indonesia 1,010.
Other:				
Crude	76	237	--	Malaysia 70; West Germany 50; Laos 50.
Slag and dross, not metal-bearing	2,880	2,924	--	Japan 1,706; India 621; Taiwan 352.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	150	480	--	All to Singapore.
Carbon: Carbon black	6,034	4,973	--	Indonesia 1,740; Sri Lanka 1,048; India 837.
Coal:				
Anthracite and bituminous including briquets	1,148	1,288	--	Sri Lanka 432; Philippines 324; Pakistan 210.
Lignite including briquets	9,601	30	--	United Kingdom 20; Japan 10.
Petroleum refinery products:				
Kerosine and jet fuel 42-gallon barrels	1,104,554	428,541	--	India 65,147; Philippines 40,632; Japan 39,335.
Lubricants do.	46,077	140,790	8	India 17,876; Japan 14,533; Philippines 12,747.
Unspecified do.	5,069	10,747	--	Singapore 8,823; Indonesia 1,210; Malaysia 644.

[r] Revised.
[1] Table prepared by Audrey D. Wilkes.
[2] Less than 1/2 unit.

Table 3.—Thailand: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	8,964	285	--	All from China.
Oxides and hydroxides	9,960	11,851	52	China 6,021; Japan 5,341; Ireland 242.
Metal including alloys, all forms	54,901	62,340	6,208	Canada 17,235; Australia 14,086; Bahrain 5,483.
Arsenic: Oxides and acids	75	289	--	Poland 200; Japan 33.
Chromium:				
Ore and concentrate	1,337	47	--	Netherlands 30; Belgium-Luxembourg 17.
Oxides and hydroxides	530	334	50	West Germany 228; Japan 21; Belgium-Luxembourg 14.
Copper: Metal including alloys, all forms	17,795	24,722	75	Japan 15,406; Zambia 4,994; Taiwan 1,642.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	12,029	425,293	87,587	Singapore 264,519; Japan 37,270; Philippines 28,936.
Iron and steel: Metal:				
Scrap	417,183	389,928	34,631	Taiwan 200,127; Canada 31,362; Republic of Korea 25,500.
Pig iron, cast iron, related materials	27,770	14,734	10	China 14,053; Japan 479.
Ferroalloys:				
Ferromanganese	2,874	2,973	--	India 842; Norway 747; China 533.
Ferrosilicomanganese	1,291	397	9	Taiwan 317; Norway 71.
Ferrosilicon	3,303	3,003	--	Norway 1,814; China 820; Taiwan 150.
Unspecified	879	236	12	China 50; Japan 50; Taiwan 50.
Steel, primary forms	359,831	457,537	9,267	Republic of Korea 131,769; Japan 116,842; Australia 81,683.
Semimanufactures thousand tons	1,040	1,185	25	Japan 973; Italy 66; Taiwan 13.

See footnotes at end of table.

Table 3.—Thailand: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides	336	483	(2)	Australia 338; West Germany 52; China 50.
Metal including alloys, all forms	12,854	11,348	547	Australia 7,723; Taiwan 1,426; Burma 1,048.
Manganese:				
Ore and concentrate, chemical-grade	3	2,932	--	All from China.
Oxides	548	163	(2)	Japan 118; China 40.
Mercury 76-pound flasks	580	315	1	China 250; Japan 33; Netherlands 17.
Molybdenum: Metal including alloys, all forms kilograms	3,488	1,637	654	United Kingdom 879; Japan 68; Netherlands 29.
Nickel: Metal including alloys, all forms	2,143	2,444	(2)	Japan 1,263; Republic of Korea 700; Canada 172.
Platinum-group metals:				
Metals including alloys, unwrought and partly wrought[3] troy ounces	6,938	1,291	5	Japan 932; United Kingdom 322.
Silver:				
Ore and concentrate[3]	1,220	54	--	All from United Kingdom.
Metal including alloys, unwrought and partly wrought thousand troy ounces	[r]6,158	418	210	Japan 159; United Kingdom 31.
Titanium:				
Ore and concentrate	955	1,225	--	Australia 1,205; Japan 20.
Oxides	602	757	1	Belgium-Luxembourg 253; Japan 235; Finland 87.
Tungsten: Metal including alloys, all forms kilograms	3,246	1,967	243	Japan 1,525; United Kingdom 152; West Germany 43.
Zinc:				
Oxides	489	581	4	Japan 241; China 190; Taiwan 85.
Blue powder	[r]20	50	--	Norway 22; United Kingdom 15; Singapore 8.
Metal including alloys, all forms	[r]39,031	34,104	60	Australia 17,533; Peru 3,960; Canada 3,785.
Other: Ores and concentrates	4,751	749	--	China 615; Australia 71; Netherlands 33.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	3,441	2,345	36	Netherlands 1,666; India 573.
Artificial:				
Corundum	395	277	17	Japan 259.
Silicon carbide	455	611	10	China 473; Switzerland 50; Norway 30.
Grinding and polishing wheels and stones	2,024	1,697	3	Japan 716; Taiwan 425; China 181.
Asbestos, crude	57,193	54,332	3,454	Canada 16,866; Botswana 12,442; Zimbabwe 8,679.
Boron materials: Oxides and acids	199	182	154	China 20; Japan 5; Australia 3.
Cement	108,532	883	--	Japan 690; France 193.
Clays, crude	14,276	9,417	1,944	Australia 3,213; Japan 2,432; United Kingdom 1,104.
Diamond:				
Gem, not set or strung carats	[r]68,559	140,161	1,187	India 102,472; Belgium-Luxembourg 16,587; Israel 6,361.
Industrial do	73,427	3,485	--	Belgium-Luxembourg 3,185; Congo 300.
Unsorted do	122,760	818,056	300	India 718,059; Ghana 51,967; Belgium-Luxembourg 41,445.
Feldspar[4]	2,648	2,252	--	India 1,850; Finland 175; Japan 154.
Fertilizer materials: Manufactured:				
Ammonia	1,972	1,546	(2)	Japan 827; Taiwan 293.
Nitrogenous	257,819	311,643	--	Japan 138,040; Belgium-Luxembourg 74,290; U.S.S.R. 44,769.
Phosphatic	5,123	6,228	5,528	Netherlands 700.
Potassic	34,483	50,964	4,800	U.S.S.R. 23,980; Belgium-Luxembourg 10,256; West Germany 5,950.
Unspecified and mixed	473,125	550,821	45,693	West Germany 170,482; Republic of Korea 163,660; Norway 43,788.
Fluorspar	408	681	--	Finland 412; India 150; Japan 118.
Graphite, natural	864	369	23	Sri Lanka 130; China 91; Republic of Korea 50.
Magnesium compounds: Magnesite	5,571	2,880	(2)	China 1,550; Japan 973; Netherlands 286.
Mica, all forms	129	127	9	Japan 52; China 20; India 20.

See footnotes at end of table.

Table 3.—Thailand: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Pigments, mineral: Iron oxides and hydroxides, processed	2,501	1,694	20	West Germany 947; Japan 295; India 185.
Precious and semiprecious stones other than diamond:				
Natural:				
Precious thousand carats	r76,490	65,788	3,980	Mozambique 27,042; Australia 23,973.
Semiprecious kilograms	r186,911	265,949	2,950	Burma 145,097; Brazil 9,259; Hong Kong 5,526.
Synthetic thousand carats	49,436	70,406	27,227	Switzerland 15,014; Taiwan 7,707; Italy 5,550.
Salt and brine	345	45,168	32	Australia 44,890; United Kingdom 142.
Stone, sand and gravel: Dimension stone:				
Crude and partly worked	7,525	66,171	--	Italy 65,841.
Worked	297	1,060	--	Italy 915; China 52.
Sulfur:				
Elemental, all forms	24,720	31,943	3,516	Canada 19,613; Singapore 8,323.
Sulfuric acid	5,063	6,053	1	Japan 5,993.
Talc, steatite, soapstone, pyrophyllite	13,458	13,931	12	China 7,770; Republic of Korea 6,017.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	6,308	4,308	38	China 2,355; Taiwan 1,060; Australia 435.
Coal, all grades including briquets	32,655	107,436	31,163	Australia 63,081; Indonesia 7,778; Vietnam 4,640.
Coke and semicoke	32,863	52,315	--	China 34,451; Japan 16,660.
Petroleum:				
Crude thousand 42-gallon barrels	50,002	46,789	--	Saudi Arabia 27,223; Malaysia 9,219; Qatar 5,081.
Partly refined do.	10,399	7,277	--	Saudi Arabia 7,250.
Refinery products do.	19,030	16,196	349	Singapore 10,169; China 1,175; Saudi Arabia 1,024.

rRevised.
[1] Table prepared by Audrey D. Wilkes.
[2] Less than 1/2 unit.
[3] May include other precious metals.
[4] Includes 18 tons of nepheline syenite in 1981 and 73 tons in 1982.

COMMODITY REVIEW

METALS

Lead.—Mine production of lead has increased steadily during the last 5 years, and the five operating mines accounted for 0.5% of world output. Thailand's lead output in 1983 ranked third in Asia after Japan and Iran.

By far the largest producer, accounting for over 75% of production, was the Song Toh Mine, currently owned and operated by Kanchanaburi Exploration and Mining Co. Ltd., a joint venture company of the Federal Republic of Germany and private Thai family ownership. The mine is about 300 kilometers northwest of Bangkok and 80 kilometers from the Burmese border.

Ore reserves of 4.5 million tons were proved after detailed exploration in 1974. High and low silver-content concentrates of lead were produced in 1983. Byproduct zinc was also present in the concentrate, but it was undetermined if the zinc was separated before the concentrate was exported. Production at Song Toh Mine continued to increase during the year but was to stabilize at 400,000 tons per year from 1984 onward.[4]

Tantalum and Columbium.—The Thailand Tantalum Industry Co. Ltd.'s (TTIC) tantalum processing plant held a formal groundbreaking ceremony in June after several reported false starts and a considerable amount of site preparation conducted during 1982. The plant, only the second of its kind in the world, will process up to 2,000 tons per year of tin smelter slags and tantalite and columbite concentrate into ferrotantalum, ferrocolumbium, tantalum oxide, and columbium oxide. Construction was apparently progressing quickly, and the scheduled completion date was moved forward into 1984.

Tin slag production, and hence its tantalum and columbium content, was down with the corresponding drop in tin production in 1983. All slag was exported, primarily to the

United States. Columbite-tantalite concentrate and tantalum-bearing struverite output increased spectacularly from the price induced slump of 1981 and 1982. The Thai Government was to prohibit slag exports once the plant nears completion and presumably would license no other tantalum plants in order that TTIC can operate at full capacity. Despite the lower slag output, Thailand remained the world's largest producer of primary tantalum materials, accounting for nearly 25% of world output.[5]

Tin.—In response to continued low prices in the tin market and quotas imposed by the International Tin Council (ITC), Thailand's production of tin fell significantly in tonnage, and in value, from $346 million in 1982 to $260 million in 1983. The biggest change came from the suction boats, from which production has gone steadily downward from 22,200 tons and 48% of concentrate output in 1980 to 4,200 tons and 15% of output in 1983. The tonnage produced by the large offshore dredges has remained roughly constant since 1980, but its proportional share has climbed from 10.8% to 20.2% in the same period.

World tin industry prices remained low because of the general economic recession and heavy competitive pressure from aluminum in the canning industry, which accounted for nearly one-half of world tin consumption. This lack of demand, even as economic conditions began to improve, led to a surplus in available tin and hence the continuing price problems that are particularly hurting the Thai mining industry.

In April 1982, ITC instituted export controls for tin producers that affected the Thai industry in 1983 and were expected to continue through 1984. The quotas imposed have been substantially lower than quarterly production, forcing the Ministry of Industry to create a stockpile fund to buy the surplus. Financing came from local banks with interest being paid by the tin miners, and the Offshore Mining Organization bearing the stockpiling costs. Initial purchases of $7.9 million rose to $30.4 million during the first quarter of 1983 when Thailand's export quota was 4,774 tons. Despite the quotas, restrictions, and stockpiles, the world surplus was reportedly over 80,000 tons in 1983. A major reason for the difference between the planned production and actual production was the tin smuggled and sold outside of export quotas.

The tin smuggling in Thailand, long a local issue, has become far more important and publicized as the volume and significance affected the whole ITC buffer stock and export control concept. In July, ITC increased the already high export quotas on its producing members to 39.6% in an effort to reduce the large tin stock surplus, which was having a depressing effect on prices. The effect in Southeast Asia was to stimulate an increase in the smuggling activity as miners sought a market for their tin concentrates.

The volume of smuggled tin was in itself a highly debated issue as a wide range of estimates was available depending on the interests of the estimating party. For example, DMR estimated 5,700 tons of tin worth at least $55 million was smuggled out of Thailand between October 1982 and April 1983. Considering the Southeast Asia area, it was clear that the smuggling problem had reached a volume that endangered the smooth operations of the International Tin Agreement, threatened to nullify the objectives of the export controls, and certainly prolonged the need for the expensive and disrupting controls.

Several attempts were made during the year to cut the illicit trade. Malaysia proposed greatly increased fines and jail sentences. Requests to the Singapore Government to control imports of tin concentrate were ineffective. Its only tin smelter was privately owned and free to operate as long as it continued to comply with existing regulations.

Thailand, however, remained the main problem area with the police having a difficult time controlling the offshore dredging operations in the Andaman Sea. Although the number of suction boats operating offshore dropped from 4,000 in 1979 to less than 800 in 1983, those that remained were more sophisticated and efficient. These technically unlicensed boats were given areas where they may operate, out of the way of the big Government-sanctioned seagoing dredges. They are required to sell their output to a representative of the Government and thereby pay the very high royalty. The royalty is by far the highest in Southeast Asia and therefore fostered a strong incentive to the miners to move the concentrate down the coast to Malaysia or Singapore and keep the increased profits themselves. Articles in the Thai press have stated that some of the smuggling was done with collusion of Government officials or police.[6]

Despite the allegations of corruption and political favoritism, the Thai law enforcement officials have made progress in curbing the illicit trade. In the first 7 months of 1983, over 400 tons of concentrate was seized, compared with 323 tons in 1982. A major crackdown on smuggling was scheduled for November 1983 when the monsoon season ends and offshore dredging begins again. In addition to the increased enforcement efforts, several changes in the tin mining regulations were proposed or adopted to help discourage smuggling. One major proposal was to allow miners to store up to twice their tin quotas as opposed to the current law, which prohibited any stockpile in excess of the legal quota. The Ministry of Industry announced that royalties now would be collected when ore is exported or sold, not while it was in storage. Previously, the royalty had to be paid as the concentrate was transported from the mine workings. In what was a vigorously debated political issue, the Government cut the tin royalty rate by about 25%. The new sliding scale rate per kilogram of tin was reduced to $2.47 to $2.63 from the previous rate of $3.25 to $3.40. The reduction, while substantial, still leaves Thailand with the highest royalty rate in Southeast Asia.[7]

In an effort to help stabilize the industry and develop new markets, Thailand, Malaysia, and Indonesia signed an agreement organizing the Association of Tin Producing Countries (ATPC) on June 17. The agreement came after 18 months of discussion on the voting procedures and price influencing mechanisms. In July, Bolivia, Nigeria, and Zaire also joined ATPC. The six members account for over 92% of world tin production. The first meeting was held in Bangkok in August. It was decided that the permanent headquarters of ATPC would be housed in the new Kuala Lumpur Commodity Exchange in Malaysia.

The search for additional reserves of tin continued during the year. The Thai Cabinet approved a proposal for the DMR to begin an offshore survey in the eastern Gulf of Thailand. The program was to cover an 8,110-square-kilometer area off the coast of Chanthaburi, Rayong, and Trat Provinces southeast of Bangkok. Traces of tin and sapphire were reported from parts of the area. When the survey is completed, the Government will ask the private sector to do the detailed evaluation and development of any commercial deposits.

On the west coast, the detailed survey of the 2,200 square kilometers of deepwater deposits was continuing. Begun late in 1982, the survey was testing the 30- to 45-meter-deep waters between Phuket and the Burma border. A 1980-82 reconnaissance of the area revealed tin values ranging from 0.19 to 2.0 kilograms per cubic meter of alluvium. Values averaging over 0.30 kilogram, if in sufficient tonnage, would probably be economically exploitable in that depth of water.

Zinc.—Construction of the 60,000-ton-per-year zinc smelter at Tak continued smoothly. The plant was begun in 1982 and scheduled for completion in October 1984. High-grade zinc silicate ores were to be mined and concentrated at Mae Sot, 80 kilometers west of Tak.

Other Metals.—The DMR has identified a significant amount of monazite in a survey of tin tailing dumps in Phuket and Phangnga in the south. The tailing dumps in the central and northern Provinces were to be surveyed during 1984. A pilot plant for the extraction of thorium from monazite was planned by the Government.[8]

NONMETALS

Cement.—Siam Cement Co. completed construction of its 180-kilometer-long gas pipeline early in the year, but, except for testing of the line, no gas was available until late in the year. After gas output from Erawan Gasfield increased, and Baanpot Gasfield came on-line, Siam Cement was allocated 20 million cubic feet per day, about one-half of its initial needs. Plans were to eventually use 90 million cubic feet per day in the operation of its two cement plants and ancillary equipment. The company will realize very little saving on the $56 million cost of the pipeline until a substantially larger gas flow is allowed. Production of cement in Thailand continued to climb for the fifth consecutive year as market conditions improved and all of the new capacity was available for production.

Fertilizer Materials.—*Nitrogenous.*—A prequalification tender for the construction of a $770 million fertilizer complex was issued by the National Fertilizer Corp. (NFC) in September, with an October 31 closing date. Over 90 companies reportedly showed interest in the project. Foster Wheeler International Corp. had already been appointed by NFC as management consultant for the project, and was initially to be responsible for screening prequalification bids. The original intention was to award the contracts in three individual packages of roughly comparable value. However, since some of the contractors formed consortia to bid on the entire complex, it is possible that the contract would go as one package. NFC requested an attractive financial arrangement to back the project, and the bidder offering the best terms would have a distinct advantage.[9]

The long-delayed construction of the plant was planned to start in late 1984. The project would require the largest investment in Thailand to date in a single industrial complex. It would consist of a complex capable of producing ammonia, urea, sulfuric and phosphoric acids, and monoammonium phosphate, diammonium phosphate, and nitrogen-phosphate-potassium fertilizers. Domestic natural gas and imported potash and phosphate rock would be used as feedstock. Thai authorities hoped that domestic potash would be able to replace the imported material within a few years of startup. Thai phosphate rock reserves are not large, but DMR was searching for reserves suitable for at least part of the phosphate requirement. The plant will be designed to furnish about 80% of the country's projected fertilizer demand for 1992.

Potash.—Late in 1982, a consortium of Anglo-French companies chosen by DMR began to conduct a feasibility study for carnallite ($KMgCl_3 \cdot 6H_2O$) exploitation at Bamnet Narong in Chaiyaphum Province. The study involved sinking a 750-meter inclined shaft and a small pilot plant beneficiation operation of 76,000 tons per year capacity.

Construction of the shaft had progressed for 285 meters when a heavy inflow of water was struck at the 60-meter level. An attempt was underway to seal off and grout the water horizon. Hydrologists were searching for the source and extent of the water at yearend. Trial production was to begin in late 1983 but was rescheduled tentatively for late 1984.

The trial mining was to test a 15-meter thick horizon containing reserves of 240 million tons of carnallite averaging 14% K_2O equivalent. The pilot plant operation was to determine the technical and economic feasibility of extracting potash from carnallite. If successful, this would be the only active carnallite exploitation in a market economy country.

Mining of the higher grade but less extensive deposits of sylvite on the Khorat Plateau remained in the planning stage after years of negotiations with several groups of potential developers.

Gypsum.—Gypsum production leveled out after rising more than 2-1/2 times between 1978 and 1982. Exports continued a dramatic climb and increased more than threefold from 1980 through 1983 when shipments reached 470,000 tons. Since 1976, the number of mines has nearly doubled to 13 and installed capacity rose to 1.5 million tons. DMR was forecasting greatly increased exports to Indonesia as Thai export prices and quality were considered very competitive.

The Government was actively encouraging the private sector producers to open new mines, and to expand and improve their existing capacities. Sahachart Sethakit Co. Ltd., which mines gypsum in Nakhon Sawan Province, planned to install improved equipment to increase production from 20,000 tons per month to 30,000 to 40,000 tons per month. The company's eight mining leases cover 897 acres with a reported 100 million tons of reserves.[10] Companies were striving to control prices by lowering mining costs through the introduction of modern mining equipment.

Salt.—The long-planned Association of Southeast Asian Nations (ASEAN) rock salt and soda ash project was indefinitely suspended by Thailand, the host country for the ASEAN-approved industry. The halt came after 6 years of planning, negotiations, and compromises among the ASEAN members. The stoppage came ostensibly because its foreign partners had not shown any real intention of helping to implement the project.

A more realistic appraisal indicated that there were just too many problems involved in the $370 million project for it to be a success. For the mine to be economically viable, it would have to have an annual production of about three times the soda ash plant requirement. There was no ready market for that much excess salt, and transportation costs would make it noncompetitive on the export market. The possibility of linking salt extraction with development of a potash mine has not been dismissed.[11]

MINERAL FUELS

Coal and Lignite.—The Electricity Generating Authority of Thailand (EGAT), the Government-owned power company, has been studying ways that the country can reduce its dependency on imported petroleum to generate electric power. One of the most promising methods currently under development was a massive program to increase the use of domestic lignite resources to the maximum extent possible.

Several projects were underway during the year. The most basic was a nationwide evaluation of lignite reserves begun in 1982 and continuing through 1983. Preliminary reports indicate mixed results of the exploration effort. New reserves were reported in Lamphun, Lampang, Phetburi, Chiang Mai, Loei, and Krabi Provinces. At least 38 million tons of new reserves were estimated in Krabi Province to a depth not exceeding 250 meters. Additional resources below that depth were also indicated. A second stage of exploration was begun late in the year with financial assistance of the Australian Government. Considerable reserves of minable lignite would be necessary at a new site to justify construction of a large-scale mine and power generating facilities.

One of the new small deposits will probably be developed for nonpower use, however. The Board of Investment (BOI) has granted approval for the Asia Lignite Co. Ltd. to mine lignite and subbituminous coal at Nongyaplong, Phetburi Province, about 120 kilometers southwest of Bangkok. The 1.4-million-ton reserve would be used as fuel in nearby cement production. Approval by BOI does not necessarily assure that the mine will be built or the financing arrangements for the investment are completed.[12]

The Mae Moh complex in Lampang Province was the largest lignite mine in the country. Currently producing more than 1.2 million tons per year, the mine supplies a pithead thermal plant containing three 75,000-kilowatt turbogenerators.

A large expansion was underway in which four 150,000-kilowatt units were being added. Unit No. 4, the first 150,000-kilowatt turbogenerator, was nearing completion and may have been tested by yearend. Units No. 5 through 7 were scheduled for completion in 1984 but their completion may have slipped somewhat.

Lignite mining was being expanded in support of the new demands. Over 12 million cubic meters of overburden were removed last fiscal year, and a large increase was scheduled for fiscal year 1983. Lignite production was to increase to more than 2.3 million tons in 1984 to feed the new power units. Reportedly, a contract for new overburden stripping equipment was awarded to a West German firm at yearend. Included in the contract were five movable conveyor systems totaling 5,500 meters, and a crawler-mounted spreader with a length of 95 meters. Commissioning of the new equipment was scheduled for yearend 1984. EGAT planned to spend over $190 million on the current Mae Moh expansion project.

Petroleum and Natural Gas.—Exploration activity continued in Thailand despite disputes between the foreign oil companies and the Thai Government. Eleven wells were drilled offshore during the year, bringing the overall offshore count to 118 wells. Of these, 59 struck natural gas and condensate, 5 produced natural gas and crude oil, and 2 produced crude oil alone. The only company drilling offshore at yearend was Union Oil Co. of Thailand working in its block 12 concession in the Gulf of Thailand.

Exploration on the part of Texas Pacific (Thailand) Inc. (TP) was hampered by a dispute over sale of its large reserve in B-structure Gasfield. TP claimed it had the right to export the gas if no price agreement could be reached on the domestic sale of its gas. After protracted negotiations, the Petroleum Authority of Thailand (PTT) reportedly offered TP two options. It would purchase the natural gas from TP at the same price paid to Union, or set up a joint venture in TP concessions. PTT, in addition, was also considering the outright purchase of the field if the price was right.

Another factor that held up additional exploration was the territorial disputes between Malaysia and Thailand, and Vietnam and Thailand. A 1.4-million-acre section of blocks 16, 17, and 18 was claimed by both Thailand and Malaysia. The two countries have been trying to work out an agreement since April 1980. Negotiations have progressed with glacial slowness. However, a draft agreement for the joint development of this highly promising area was believed to be ready for submission to the legislation of each country in early 1984.

Compounding the joint-area border demarcation was a claim by Vietnam that the eastern edge of some of the Thai blocks encroach on its territorial waters. Vietnam was reported to be willing to settle the dispute through negotiations and in conformity with international law. Triton Energy Corp. and TP, which hold the concessions in those blocks, cannot do exploration work there until at least the Malaysian problem is settled.

Natural gas production from the offshore Erawan Gasfield continued to be a very

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controversial issue. Gas in the field turned out to occur in small pockets rather than in a continuous reservoir. As a result, production has never been what was originally planned, and Union already has had to drill 60% more wells than expected to maintain a lower level of production than planned.

By yearend, production from Erawan reached 159 million cubic feet per day, well short of the guaranteed 250 million cubic feet per day. The shortfall caused disputes between the company and Thai Government agencies. First, PTT applied a 20% penalty on the purchase price paid to Union for not delivering the contracted amount of gas. The 250-million-cubic-feet-per-day production contract was based on a formula dependent on the proved reserves in the gasfield. In an effort to resolve the matter, Union commissioned a new study by a consultant that showed reserves at only 628 billion cubic feet, compared with the original estimate of 1,580 billion cubic feet. The lower estimate would lower Union's contract obligation to 130 million cubic feet per day. In December, the Thai Government accepted the new estimate, retroactive to July 23, 1983, the day the new estimate was received. Penalties assessed to that date were not reimbursed.

In an effort to increase production as quickly as possible, Union initiated development of its second gasfield well ahead of its original plans. Named the Baanpot Gasfield (also spelled Banphot), it is 24 kilometers southeast of Erawan Gasfield, and has reserves of 470 billion cubic feet. Production began on October 31 at 14 million cubic feet per day of gas and 400 barrels per day of condensate. This was to be increased to over 30 million cubic feet per day by mid-1984.

Development of two more fields was progressing well. Satun Gasfield, with reserves of 658 billion cubic feet is just east of Erawan. Platong Gasfield, with reserves of 376 billion cubic feet, is north of Erawan and 40 kilometers from the main pipeline. Eight of eleven production platforms for these two fields were in place by yearend. Production from them was scheduled to begin in early 1985.

As events now stand, the offshore natural gas situation is not as pessimistic as some Thai press reports would have it. Some form of agreement will probably be reached with TP. Despite the revised reserves situation and pricing negotiations, Thailand has begun to feel the economic benefits of the offshore exploration and development. Even if no new discoveries are made, production is scheduled to increase by about 100 million cubic feet per day each year for 5 or 6 more years. Production will be sufficient to substitute for a sizable quantity of expensive imported petroleum, and support a planned fertilizer and petrochemical complex in Rayong Province.

Onshore activity in 1983 was highlighted by Shell Exploration and Production Co. Ltd.'s startup of crude oil production at the Sirikit Oilfield in Kamphaeng Phet Province. Initial flow from this, Thailand's first commercial oilfield, was 5,000 barrels per day. Production increased to over 9,000 barrels per day at yearend as additional wells were completed.

The $320 million gas separation plant being built southeast of Bangkok where the offshore pipeline comes ashore was behind schedule and was expected to be completed in 1985 instead of early 1984 as originally planned. The first-stage construction was to separate 350 million cubic feet per day of natural gas into ethane, propane, and the heavier hydrocarbons. These were to be used as feedstock for downstream petrochemical projects. One of these, the low-density polyethylene plant, was reportedly completed and operating on imported feedstock until the olefin plant comes onstream.[13]

Onshore exploration continued at a relatively brisk pace. Thai Shell spudded at least 21 wells and completed 9,400 line-kilometers of seismic survey. Esso Exploration and Production Khorat Inc. spudded two wells and conducted nearly 7,800 line-kilometers of seismic survey. Esso Udon Corp. also drilled two wells and ran 3,325 line-kilometers of seismic survey. Phillips Petroleum International completed 4,046 line-kilometers of seismic work but had not begun its drilling program at yearend.

Several of the new wells were believed to have struck oil or natural gas but more work would be needed to determine if any of the wells were commercially viable. Much of the exploration was in remote and formidable terrain. As such, a fairly large flow of oil would be needed to justify development of any discoveries in northeast concession blocks. Large reserves of natural gas would be necessary to justify development.

The Thai Oil Refinery Co. Ltd. planned to expand its Sri Racha refinery for the past several years. In the 1983 plan, the expansion was to consist of a new high-vacuum distillation unit, a hydrocracker and ancillary units, and comprehensive environmental control equipment. The project would rearrange the refinery product mix and increase the overall throughput capacity from 65,000 to 100,000 barrels per day at a cost of over $600 million.

Negotiations were underway all year, with the total cost and financing arrangements being the major problem. Engineering and construction was to be by a British-French consortium of Davy International Projects Ltd., Compagnie Française d'Etudes et de Construction Technip, and Procofrance S.A.

In December, in an effort to gain more favorable financing and an overall reduction of the price, a Thai official stated that new bids would be called for the expansion project. At yearend, the issues were far from settled. French and British financial organizations were revising their old proposals and several other international consortia were standing by to make counter offers if the British-French group's new offers were unacceptable to the Ministry of Industry.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Thai baht (B) to U.S. dollars at the rate of B23.0=US$1.00.

[3] Metric tons (2204.6 pounds) are used throughout this report.

[4] Japan Mining Industry Association. Bull. No. 392, Nov. 1983, pp. 8-12.

[5] U.S. Embassy, Bangkok, Thailand. State Dep. Telegram 45306, Aug. 1983.
U.S. Embassy, Manila, Philippines. State Dep. Telegram 17769, Apr. 1984.

[6] Bangkok MATICHON in Thai. Dec. 8, 1983, p. 4.

[7] Metal Bulletin. No. 6819, Sept. 9, 1983, p. 7.

[8] Mining Magazine. V. 150, No. 2, Feb. 1984, p. 127.

[9] Chemical Industry News. V. 18, No. 17, Nov. 1983, p. 560.

[10] Industrial Minerals. No. 193, Oct. 1983, p. 53.

[11] Business Times (Kuala Lumpur). Feb. 11, 1984, pp. 1, 14.
The Bangkok Post. Feb. 19, 1984, p. 7.

[12] Mining Journal (London). V. 302, No. 7742, Jan. 6, 1984, p. 10.

[13] Business Times (Kuala Lumpur). July 16, 1983, p. 20.

The Mineral Industry of Tunisia

By Kevin Connor[1]

The most pronounced change in the Tunisian mineral industry for 1983 was the 41% increase in phosphate rock production, a result of modernization and expansion work carried out in the phosphate mining and fertilizer processing industries. Subsequent fertilizer output increased a substantial 18%, as Industries Chimiques Maghrebines started up its third manufacturing plant at Gabès in December 1982. The crude petroleum sector, with a registered increase in production of 8.6% over 1982 figures,[2] also exhibited signs of growth during the year. Owing to intensification of exploration efforts over the previous few years, as witnessed by over two dozen companies actively drilling onshore and offshore during 1983, new modest size oil and gas fields continue to be discovered, which should insure Tunisia's energy self-sufficiency and role as a net exporter of petroleum throughout the remainder of the decade. Because of the recessional conditions in the petroleum sector over the past 3 years, the $500 million expansion project at the Bizerte oil refinery was postponed. However, completion of the Transmediterranean (Transmed) gas pipeline carrying natural gas from Algeria to Italy across northern Tunisia and initiation of a petroleum products storage and blending facility at La Skhira were just two of a number of projects for the year that reflected a continuing strong Government commitment to the country's oil and gas industry. As in previous recent years, crude petroleum export trade was Tunisia's largest foreign exchange earner with a total net revenue of $940 million for 1983.

PRODUCTION AND TRADE

Mineral production and trade volumes increased overall for the year, and net revenues from the export trade improved 12% over those of 1982. The crude petroleum and phosphate industries, which represented over 95% of Tunisia's mineral export trade, were the major reasons for improvement in the sector, not only because of increased volumes traded but also owing to the increased strength of the dollar, the currency in which both Tunisian petroleum and phosphate products are traded. Crude petroleum export volumes increased by approximately 10%. Exports of rock phosphate were up 6% and chemical fertilizer exports increased 16% over 1982 figures. Domestic use of fertilizer by Tunisian farmers increased 19% over the year, making up some of the difference between the growth in production and export levels. Stockpiling of phosphate rock also increased dramatically.

As in previous years, Tunisia's major export was petroleum; principal recipients were the United States and Italy. Tourism receipts was a strong second, textile manufacturing was third, and phosphate rock, chemical fertilizers, and other minerals were fourth with receipts of approximately $250 million. Fertilizer products were traded to traditional markets in Western Europe, the Middle East, and northern Africa. Even though mineral commodity prices were depressed throughout the year, there was a general upswing in the volumes traded and some improvement in prices the second half of the year.

Except for crude oil and phosphates, the other mineral sectors experienced a third year of declining production and trade. Iron ore production was up 14.9%, but 1982 production had been artificially depressed because the steel plant at Bizerte was shut down 3 months for maintenance, so that the 1983 production level was still 20% less than 1981 output. Fluorspar output was up slightly, 2.4% to 34,013 tons. Production of lead concentrate at 7,990 tons and zinc concentrate at 13,700 tons was down 11.2% and 8.7%, respectively. Output of barite and sea salt was also down 34% and 29%, respectively. Depletion of economical deposits and antiquated equipment were cited as the major reasons for the decline.

Table 1.—Tunisia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Iron and steel:					
Iron ore and concentrate, gross weight thousand tons	394	389	396	275	[3]316
Metal:					
Pig iron do.	150	151	160	[r][e]100	150
Steel, crude do.	176	178	178	[r][e]110	165
Lead:					
Mine output, metal content	10,021	8,310	5,661	4,988	4,700
Metal:					
Primary[4]	16,163	19,195	17,530	15,320	[3]10,398
Secondary[e]	600	600	500	500	500
Total	16,763	19,795	18,030	15,820	10,898
Silver, primary thousand troy ounces	231	235	84	115	[3]90
Zinc, mine output, metal content	8,706	7,579	7,458	7,088	[3]6,308
NONMETALS					
Barite	14,929	26,949	24,671	30,654	[3]20,250
Cement, hydraulic thousand tons	1,383	1,780	2,020	[e]2,000	2,500
Clays, construction do.	280	300	352	[e]350	350
Fluorspar, chemical- and metallurgical-grade	33,808	39,451	34,844	33,209	[3]34,013
Gypsum	60,000	[e]75,000	[e]75,000	[e]75,000	85,000
Lime thousand tons	430	529	466	[r][e]465	[3]580
Phosphate rock, gross weight do.	4,154	4,582	4,543	4,196	[3]5,924
Salt, marine do.	400	437	467	421	300
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural:					
Gross[e] million cubic feet	28,000	28,000	28,000	28,000	30,000
Marketed do.	11,657	12,700	13,703	14,883	15,000
Petroleum:					
Crude thousand 42-gallon barrels	42,679	43,100	41,600	39,324	42,710
Refinery products:					
Gasoline do.	1,292	1,085	1,391	1,498	1,500
Kerosine do.	1,777	1,684	1,837	2,277	2,300
Distillate fuel oil do.	3,166	3,016	3,156	3,025	3,100
Residual fuel oil do.	4,294	4,099	4,380	3,545	3,700
Other do.	358	325	414	445	500
Refinery fuel and losses do.	150	652	1,336	197	200
Total do.	11,037	10,861	12,514	10,987	11,300

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through June 14, 1984.

[2] In addition to the commodities listed, a variety of crude construction materials (common clays, sand and gravel, and stone) is produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

[4] From domestic and imported ores.

COMMODITY REVIEW

METALS

Iron and Steel.—The steel sector registered a substantial increase in 1983 over the previous year's production, but only owing to the previous year's artificially depressed conditions caused by the 3 month maintenance shutdown at the Fouladh steel plant near Bizerte. Production of crude steel was up 50%, with wire rod up 13% to 24,800 tons and rolled steel down 1% to 161,400 tons. When compared with 1981's uninterrupted production figures, the 1983 results were down 7.3% for steel, up 2.5% for wire rod, and down 1% for rolled steel.

The World Bank approved a $16.8 million loan agreement in June with the Tunisian Government for expanding and modernizing the iron and steel foundry at Megrine Raidh, just outside the capital city of Tunis. Completion of the project as planned would approximately double the foundry's casting capacity to 7,500 tons per year. The planned expansion reflected the Government's continuing commitment to industrialize the economy to meet domestic demand, as well as developing an iron and steel products exporting capacity. Klöckner-Humboldt-Deutz AG of the Federal Republic of Germany was selected to provide technical assistance and training for the project. Financing was to be provided by three joint venture banks, Tuniso-Saudi Investment and Development Corp., Tuniso-Kuwaiti Development Bank, and by the Arab Mining Co./Arab Industrial Development Co./Islamic Development Bank, which together were expected to contribute $12.1 million in share capital. Total financial commitments to the project were $54.1 million.

NONMETALS

Cement.—The cement industry realized considerable growth during the year as technical problems were solved at two plants, and the country's fifth portland cement plant came on-stream. Output of calcined lime was up 25%. Production of portland cement was up 25%, and the portland cement capacity of the country was increased to 3.73 million tons with the fifth plant startup. The projection for 1984 cement production was over 3 million tons, while the projected domestic consumption was just under 3 million tons. Subject to the validity of these predictions, 1984 may be Tunisia's first year without cement imports and a surplus of cement stocks for possible export.

Work continued throughout 1983 on Société Tunisienne de Ciment Blanc's 100,000-ton-per-year white cement plant. No major delays were encountered in the construction schedule, and startup of the facility was still planned for the spring of 1984. Société des Ciments Tunisiens' 1-million-ton-per-year cement plant at Jebel Oust near Aghovan started limited production operations late in 1983. Société de Industries Cimentieres du Centre began trial operations during midyear at its new 1-million-ton-per-year plant at Enfida. The construction of this plant, which was a turnkey contract, was done by Kawasaki Heavy Industries of Japan. Polysius Ltd. finalized a contract late in the year with Société des Ciments de Jebel Oust for installing a cement production line at the existing Bir M'Cherga plant. The work for the 3,300-ton-per-day line was to include a precalciner kiln, raw material ball mill, two closed-circuit finishing mills, and a laboratory automation unit.

Fertilizer Materials.—In spite of the continued depressed state of the world fertilizer industry during the year, Tunisia increased phosphate production substantially. The downstream conversion fertilizer industries utilized the majority of the increased production, with only a slight increase in phosphate rock exports registered. As in previous years, two major government parastatals were in charge of the phosphate sector: Le Groupe Chimique Tunisien controlled and coordinated a string of companies operating at Sfax and Gabès that chemically transform the phosphate rock into various grades of fertilizer; and Compagnie des Phosphates de Gafsa (CPG), the agency responsible for all mining related activities, continued with plans to develop open pit operations in both the Gafsa Basin and Sra Quertane in northwest Tunisia. During the year, CPG moved its headquarters office from Tunis to Metlaoui. CPG has been allocated $125 million[3] in the Sixth Development Plan period to modernize old mines and develop new ones. In 1983, there were eight phosphate mines operational in Tunisia, with seven of these mines located in the Gafsa Basin. Le Groupe Chimique Tunisien was to expend $380 million for constructing new chemical conversion plants and support facilities during the current 5-year plan, and $75 million for maintenance of existing fertilizer plants.[4]

In February, Engrais de Gabès, one of the five fertilizer companies of Le Groupe Chimique Tunisien, selected Tecplant Ingest of Spain and Technipetrol of Italy to build its new diammonium phosphate (DAP), nitrogen-phosphorous-potassium (NPK) complex. The contract, which was valued at $35 million, was signed by the involved parties on March 4, 1983. Construction on the project began before the end of March with work on chemical conversion units to produce 1,200 tons per day of DAP or 1,500 tons per day of NPK. The ammonium nitrate unit was to be built utilizing the Espindesa process. Other new facilities were to include a 25,000-ton ammonia and 40,000-ton finished-product storage building. Construction of the complex, which was near the existing monoammonium phosphate unit at Gabès, was scheduled to take 27 to 30 months to complete.

In September, the Tunisian Government and CPG secured a $14 million World Bank loan for a technical assistance project valued at $21.5 million. The project was designed to evaluate a number of areas including the following: consultant services to review CPG's organization and management and establish a better cost control system, review the agency's existing underground mining operations, review spare-parts and personnel administration systems and introduce computer processing to both, train maintenance staff, carry out feasibility studies on new mines and the rehabilitation of existing beneficiation plants, and carry out studies and implement plans for expansion of the Ker Eschfair Mine. Also to be included were consultant services and laboratory equipment for evaluating three potash deposits in the country. Also during the year, Jacobs Engineering Co. of the United States began the first phase of a multimillion-dollar project to evaluate the development potential of phosphate reserves of the Sra Quertane area.

In November, it was announced that Société Industrielle d'Acide Phosphorique et d'Engrais (SIAPE) had invited three companies—Spie Batignolles/Heurtey of France, Sim-Chem of the United Kingdom, and Hitachi/Mitsubishi of Japan—to compete for a contract to build the sulfuric and phosphoric acid facilities planned for La Skhira. The plants, which would utilize Gafsa Basin phosphate rock as feedstock, were planned as two 1,750-ton-per-day sulfuric acid units, two 550-ton-per-day phosphoric acid units, and a unit to produce 1,000 tons per day of superphosphoric acid. The contract was expected to be awarded early in 1984.

MINERAL FUELS

Natural Gas.—Marketed natural gas production in 1983 was approximately equal to that of 1982 at about 43 million cubic feet per day. Along with the royalty gas from the Transmed pipeline, the consumptive needs of the country were satisfied by the nation's domestic production. The Transmed pipeline, which was constructed over the past 4 years, runs through the northern part of Tunisia connecting the gasfields of Algeria with Italy. Government officials expected domestic demand to continue to increase rapidly, with consumption of gas quadrupling to almost 200 million cubic feet per day by 1990. If the development of the new Franig Oil and Gas Field goes according to plan, natural gas available for consumption could double by mid-1985. This would keep pace with the projected demands.

In May 1983, the Governments of Tunisia, Algeria, and Italy officially inaugurated the Transmed gas pipeline linking Algeria and Italy. Transit fees payable to the Tunisian Government, in natural gas or monetary exchange, were set at 5.25% for volumes under 700 billion cubic feet per year, increasing to 6.75% for any additional volumes over that figure. Gas quotas deliverable to Tunisia agreed upon were 4.9 billion cubic feet in 1983, 12.7 billion cubic feet in 1984, 16.7 billion cubic feet in 1985, and 23.3 billion cubic feet in 1986. At 1983 gas prices, these volumes represented transit fees of $21.4 million in 1983, rising to $102 million in 1986.

Petroleum.—In 1983, Tunisia was able to export approximately one-half of its 115,000-barrel-per-day oil production. Despite lower oil prices, the commodity remained the country's principal source of foreign exchange. Total crude oil production volume for 1983 was 8.6% above the 1982 total. The increase was mainly due to modest production increases in the El Borma Field production, and the new Tazarka offshore field, which went into production late in 1982. El Borma, the oldest producing field in Tunisia, continued to surprise the experts with its increasing yields, and accounted for two-thirds of the country's total production for the year. Tazarka was responsible for over 4 million barrels of the country's petroleum production in 1983, which more than accounted for the year's registered increase. In 1982, petroleum production from the Ashtart offshore facilities, Tunisia's second largest field, declined 18% below that of 1981, to approximately 12 million barrels. There was a further 10% decline in 1983, which reduced the yearly total production for the field to under 11 million barrels. Technical problems have been the principal factors causing the decline in production, with difficult operating conditions having caused high failure rates for pumping equipment. Also, faulty equipment delayed the initiation of gas-lifting and collecting operations that were originally scheduled to begin early in the year. New and improved equipment replacements, along with the installation of a second production platform during 1983, were expected to increase the field's output almost 20% by 1985. Production from Tunisia's other mature fields, El Italyem, El Douleb Tamesmida, and Chouech Fields, fluctuated throughout 1983 but in general declined. These three fields combined only accounted for roughly 5% of the country's total production.

It was forecast that domestic petroleum demand levels would equal crude production rates sometime early in the 1990's. The forecast was based on 1983 petroleum production and domestic consumption levels; the Government's projected growth rates for these two sectors—a leveling off in annual production and a 10% annual increase in consumption; and the prospects for finding and developing new fields. In light of this forecast, an ambitious program of indigenous petroleum exploration continued in 1983, with several exploration and exploitation permits being awarded to United States, European, and Persian Gulf petroleum firms. In the first half of the year, three new exploitation concessions were awarded, all to U.S. firms. The Franig Oilfield was awarded to U.S. Amoco Oil Co., the Hajeb-Guebiba Field to Houston Oil and Minerals Corp., and the Biban Oilfield to the Marathon Oil Co. All three of these fields looked promising and should have a significant impact on the nation's oil production by 1985. In September 1983, the French company Société Nationale Elf Aquitaine announced an oil discovery in the Gulf of Hammamet southeast of Nabeul. Preliminary testing of the well showed almost 6,000 barrels per day of high-quality, sulfur-free, light crude from three distinct producing zones. Further drilling was scheduled for defining the extent of the field. In September, the Natomas Co. of the United States was awarded an offshore exploration permit in the Gulf of Gabès, as was also Marathon Oil of the United States, whose exploration concession was reported to be off the coast of Zarsis.

Late in the year, the Kuwait Foreign Petroleum Exploration Co. (KUFPEC) signed two agreements for joint venture concessions covering 10,000 square kilometers of exploration acreage in Tunisia. The agreements covered two areas in the Kairouan region of northeast Tunisia, 100 kilometers west of Sfax. The first area, North Kairouan, has an area of about 6,000 kilometers. The venture participants included Tunisia's state oil company Enterprise Tunisienne des Activities Petroliers (ETAP) with 55% interest, KUFPEC with 30% interest, and France's Elf Aquitaine with the remaining 15%. The second area, South Kairouan, has an area of almost 4,000 square kilometers, and the venture participants are ETAP (55%) and KUFPEC (45%). KUFPEC was to be the operator for both permits. This would be the first time the company, which is a subsidiary of the Kuwait Petroleum Corp., had undertaken an operator role in its history of exploration ventures. The agreement provided for an initial period of exploration of 4 years; renewable for two further periods of 4 years each. Contract obligations called for the drilling of four wildcat wells in each area during the initial lease period. In the event of a commercial find, there was a provision for a 15% royalty and a sliding-scale tax rate ranging from a minimum of 60% and a maximum of 80%, depending on the production rate. Besides these latest aquisitions in Tunisia, KUFPEC also had exploration ventures in Angola, Australia, Congo, Egypt, Indonesia, Italy, Oman, Sudan, Tanzania, and Turkey.

In December, the U.S. firm Pennzoil Co. and an independent Texas oil developer, signed an exploration agreement with the Tunisian Government for the Didon and Elyssa concessions in the southern part of the Gulf of Gabès. The agreement called for the drilling of three exploratory wells within the 1984-86 period. Seismic survey work was also a requirement of the contract. Subsequent to the accord, Pennzoil Tunisia, a subsidiary of Pennzoil, was formed with offices to be set up in Tunis and Sfax. Seismic work was scheduled to begin early in 1984, with drilling operations slated for early 1985. Development control of any commercially exploitable deposits found was to be divided 57.5% Tunisian Government, 38.25% Pennzoil, and 4.25% Mr. Rutherford. As a standard practice, the foreign partners would be reimbursed for exploration costs in the event of commercialization of a deposit find.

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[1] Physical scientist, Division of Foreign Data.

[2] U.S. Embassy, Tunis, Tunisia. Tunisia: Mixed Economic Performance in 1983. State Dep. Telegram 2370, Mar. 28, 1984, p. 1.

[3] Where necessary, values have been converted from Tunisian dinars (D) to U.S. dollars at the rate of D0.66=US$1.00.

[4] Financial Times (London). Sec. 4, Mar. 16, 1984, pp. 1-6.

The Mineral Industry of Turkey

By Peter J. Clarke[1]

The growth in Turkey's mining sector did not keep pace with the overall expansion in the economy in 1983, although several favorable developments pointed toward future growth of the industry. Turkey was in the fourth year of a stringent economic stabilization program designed to reduce inflation; improve the trade balance; and develop a more free market, profit-oriented industrial organization, which up through the current year was dominated by large, state-owned firms called State Economic Enterprises (SEE). The mineral industry was to play an important part in this program by developing the country's natural resources to provide domestic employment, domestic energy sources, and foreign exchange from mineral exports.

Turkey remained an important supplier of minerals to world markets, holding its position as the world's second largest producer of boron minerals, but dropping slightly in chromite production to about eighth position in the world. Turkey was also a large producer of copper, coal, magnesite, barite, and iron and steel, which were mostly of domestic significance.

Turkey's economy continued to grow, although at a somewhat slower pace of 3.2% per year, compared with 4.4% and 4.6% in 1982 and 1981, respectively. Inflation, while still high, at 30% per year, has been reduced from over 100% in the early 1980's. There was no growth in the mineral sector, with gains in some areas, notably coal and iron and steel, more than offset by production decreases in other areas, such as aluminum, copper, chromite, zinc, and petroleum.

In conjunction with the economic reform program, the Government was taking several steps to encourage investment and growth in the mining and industrial sector. In May, the Government published a decree reorganizing the SEEs into two categories. Those that provided essential services, such as postal services, rail, and air transport, were to be known as Public Economic Corporations and were to be closely regulated by the Government. The SEEs were to begin operating for profit in direct competition with the private sector, although still owned by the Government. Among the latter group were Etibank, the SEE responsible for mining, and Turkiye Petrolleri Anonim Ortakliki (TPAO), the state oil company. As part of Etibank's trimming for competition, the Government authorized the return of most iron ore and lignite mines that were nationalized under Law 2172 of 1978 to their former private owners. Etibank was also strongly encouraging foreign investment in the mining industry, as direct investment by a foreign company, or as a joint venture with Etibank or a private Turkish company. The largest example of this new commitment was a $150 million[2] joint venture between Etibank and Phelps Dodge Corp. of the United States to develop the Cayeli copper deposit in northeastern Turkey.

The Government also passed a new petroleum law designed to encourage new investment in oil production. The law provided for the export of 35% of oil produced onshore or 45% of oil produced offshore from wells drilled after January 1, 1980. New resolutions were also passed allowing repatriation of profits to banks outside Turkey and other incentives to attract foreign capital. The lack of domestic capital for the SEEs and even private Turkish companies has been a major cause of the chronically low capacity utilization and efficiency in many of Turkey's mineral industries. With these new regulations in place, the Government has taken a major step toward increasing productivity and raising the mineral sector's contribution to economic growth.

PRODUCTION

Mineral production generally declined from the 1982 level, with a few notable exceptions. The largest declines were registered in aluminum, boron, chromite, blister copper, manganese, petroleum, and zinc. Production increases occurred in coal, fertilizer, iron ore, and steel. Capacity utilization in most mineral industries remained low, averaging 62% in 1983, owing to the weak level of domestic demand, low prices for mineral exports, and shortages of energy for mining and processing. Overall, the mineral sector's contribution to the gross national product fell from a high of over 3% in 1981 to below 2% in 1983. The Government was attempting to revitalize the industry by encouraging new investment by private and foreign companies, and by investing directly in modernization and expansion projects. The copper industry was undergoing such a program under the auspices of Etibank, other private producers, and foreign companies. Fertilizer production was already beginning to show the benefits of such an investment program begun in 1981. Several modernization projects were also underway at the Government's large steel mills at Karabuk and Iskenderun.

Table 1.—Turkey: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982^{p}	1983^{p}
METALS					
Aluminum:					
Bauxite	^{r}155,160	^{r}546,468	589,008	508,392	296,280
Alumina	^{r}70,152	^{r}137,520	131,400	84,204	57,420
Metal	31,720	33,574	39,985	36,520	32,200
Antimony:					
Ore, mine output:					
Gross weight	^{r}9,311	^{r}22,029	27,949	35,982	^{e}35,000
Metal content	^{r}280	^{r}969	838	1,079	^{e}1,050
Regulus	50	^{r}87	45	144	^{e}140
Chromite:					
Gross weight (34% to 43% Cr_2O_3)	^{r}586,057	^{r}550,719	574,474	616,539	481,620
Salable product	^{r}373,144	^{r}381,998	422,550	407,697	^{e}330,000
Copper:					
Mine output, metal content	31,400	^{r}26,400	31,881	34,430	25,025
Metal:					
Smelter	22,245	15,937	27,273	25,313	18,516
Refined	15,161	15,571	24,220	32,200	30,000
Iron and steel:					
Iron ore, gross weight thousand tons	^{e}3,000	2,579	2,935	2,855	4,151
Metal:					
Pig iron and ferroalloys:					
Ferrochromium	^{e}30,000	^{e}32,000	40,775	39,862	30,175
Ferrosilicon	--	--	--	4,300	4,500
Pig iron and other ferroalloys thousand tons	2,228	2,040	1,954	2,329	2,953
Steel, crude including casting do	2,396	2,536	2,363	2,795	3,542
Lead:					
Mine output, metal content[2]	7,500	6,700	8,042	6,403	6,300
Metal, smelter, primary	^{r}4,900	6,500	4,800	2,500	1,500
Manganese ore, gross weight	41,584	41,634	14,937	7,308	3,204
Mercury 76-pound flasks	4,786	4,437	5,927	7,144	^{e}3,650
Silver, mine output, metal content^{e} thousand troy ounces	250	200	200	^{r}220	220
Tungsten, metal content of concentrate	56	96	153	^{e}150	^{e}170
Zinc:					
Mine output, metal content[3]	^{r}24,900	23,300	30,721	31,500	11,100
Metal, smelter, primary	17,200	12,600	18,100	14,900	8,800
NONMETALS					
Abrasives, natural: Emery	47,914	39,940	45,824	35,164	22,846
Asbestos	^{r}600	^{r}18,162	3,860	958	975
Barite	100,005	^{r}128,352	185,555	107,393	76,457
Boron materials thousand tons	703	801	843	787	^{e}662
Cement, hydraulic do	13,784	12,875	15,043	15,778	13,596

See footnotes at end of table.

Table 1.—Turkey: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[p]
NONMETALS —Continued					
Clays:					
Bentonite	[e]14,000	[e]20,000	30,687	[e]31,000	[e]31,000
Kaolin	[e]59,000	[e]50,000	44,795	45,000	[e]55,000
Other	[e]300,000	[e]110,000	150,942	152,188	107,865
Diatomite[e]	9,000	9,500	10,000	10,000	[4]9,600
Feldspar[e]	72,600	72,000	70,000	70,000	9,212
Fluorspar	6,200	[e]6,000	1,986	[e]2,000	2,000
Graphite	NA	NA	NA	3,360	3,360
Gypsum	[e]63,500	[e]72,200	90,470	90,500	75,572
Lime thousand tons	1,000	1,000	900	900	1,000
Magnesite, crude ore	729,442	[r]825,876	783,966	905,159	737,916
Meerschaum kilograms	5,100	6,250	17,600	12,850	11,400
Nitrogen: N content of ammonia	205,000	[r]184,000	325,800	306,360	320,000
Perlite	30,000	25,800	45,000	121,527	28,693
Phosphate rock	[e]27,000	[r]21,285	42,500	[5]35,400	104,482
Pyrites, cuprous, gross weight	36,855	77,272	67,632	[r] [e]50,000	36,400
Salt, all types thousand tons	[r]945	[r]1,179	1,396	1,313	[e]1,400
Sodium compounds, n.e.s.:					
Sodium carbonate[e]	70,000	60,000	60,000	60,000	[4]38,835
Sodium sulfate	[r]95,079	[r]88,021	65,822	65,188	53,337
Stone, sand and gravel, n.e.s.:					
Limestone thousand tons	[e]100	90	467	338	342
Marble	[e]35,000	15,871	36,832	24,110	39,110
Quartzite	[e]240,000	[e]240,000	197,883	[e]200,000	239,201
Sand, siliceous	[e]60,000	[e]60,000	113,826	[e]110,000	110,000
Strontium minerals: Celestite[e]	18,000	16,000	15,000	15,000	[4]38,835
Sulfates, natural, n.e.s.: Aluminum sulfate (alunite)	[e]6,000	[e]6,000	11,543	[e]11,500	14,682
Sulfur:					
Native, other than Frasch	21,004	23,051	28,270	28,500	[e]31,000
S content of pyrites	15,921	33,382	29,217	30,100	[e]25,000
Byproduct	70,000	70,000	120,000	126,444	124,089
Total	106,925	126,433	177,487	185,044	[e]180,089
MINERAL FUELS AND RELATED MATERIALS					
Asphalt, natural thousand tons	1,059	559	560	523	[e]750
Carbon black	16,000	15,900	18,108	19,922	[e]20,000
Coal:					
Bituminous thousand tons	4,051	3,730	3,973	4,200	[e]6,122
Lignite do.	11,600	12,760	16,257	17,750	[e]20,700
Coke and semicoke:					
Metallurgical do.	2,625	1,928	1,875	2,102	[e]2,380
Gashouse[e] do.	300	300	250	300	121
Breeze[e] do.	125	125	100	125	260
Total do.	3,050	2,353	2,225	2,527	[e]2,761
Gas, natural:					
Gross million cubic feet	36,000	30,000	[e]29,000	26,050	27,000
Marketed do.	1,200	1,000	[r] [e]3,000	[r] [e]3,500	3,500
Petroleum:					
Crude thousand 42-gallon barrels	20,276	16,682	16,918	16,697	[e]15,768
Refinery products:					
Gasoline do.	15,960	16,131	16,341	15,140	[e]16,957
Jet fuel do.	1,460	1,165	1,716	2,360	[e]2,263
Kerosine do.	3,429	3,682	2,386	2,035	[e]4,567
Distillate fuel oil do.	17,520	36,891	38,557	43,580	[e]47,664
Residual fuel oil do.	30,295	20,682	23,431	26,490	[e]30,512
Lubricants do.	1,182	1,200	[e]1,000	[e]1,100	[e]1,563
Liquefied petroleum gas do.	4,229	4,324	3,742	3,430	[e]4,865
Naphtha do.	139	114	[e]210	[e]210	[e]8,156
Asphalt do.	1,972	1,615	2,177	1,875	[e]2,534
Unspecified do.	3,500	3,547	3,814	4,480	[e]6,226
Refinery fuel and losses do.	1,203	[e]1,200	[e]1,200	1,200	[e]1,200
Total do.	80,889	90,551	94,574	101,900	[e]126,507

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through June 30, 1984.

[2] Includes Pb content of lead-zinc ores but excludes Pb content of zinc ore.

[3] Includes Zn content of zinc and lead-zinc ores but excludes Zn content of lead ore.

[4] Reported figure.

[5] Run-of-mine ore contains 27% P_2O_5.

TRADE

Mineral exports earned approximately \$200 million in 1983, down more than 3% from those of 1982. These exports contributed roughly 3.5% to the total exports, down from a high of 4.5% in 1981. Total exports increased less than 1%, to about \$5.8 billion. Exports, especially to Turkey's primary Middle Eastern trading partners, Iran, Iraq, and Libya, were adversely affected by the conflict between the former two. After a 22% rise in exports from 1981 to 1982, and a predicted 10% rise for 1983, the actual performance was less than hoped for by the Government. Total imports reached \$8.7 billion, about the same as in 1982, leaving a trade deficit of nearly \$3 billion. U.S. exports to Turkey were \$783 million, and imports from Turkey were \$320 million. The U.S. Export-Import Bank (Eximbank) agreed to guarantee the sale of \$217 million worth of U.S. mining equipment to Turkey, mostly for use in coal mining. The Eximbank action typified the Western nations' renewed confidence in Turkey's economy, despite the sluggish performance in 1983.

COMMODITY REVIEW

METALS

Chromite.—Production of chromite ore declined 22% owing to weak demand worldwide for chromite ore and the continuing closure of chromite mines by several of the Turkish private sector producers. Turkey slipped to about the eighth largest producer of chromite in the world from its fifth-place position in 1982. Measured minable ore reserves in the country were placed at 12.8 million tons, with another 5 million tons of indicated reserves, mostly grading 40% to 45% Cr_2O_3. The total reserve base was estimated at 36.2 million tons.[3]

Although chromite deposits have been located in 40 of the country's 67 Provinces in 640 chromite occurrences, there were only 5 main chromite mining areas. In order of relative importance, these were the Guleman-Elazig area in eastern Turkey, the Fethiye-Koycegiz area in southwestern Turkey between Antalya and Izmir, the Bursa-Orhaneli region in northwestern Turkey, the Pozanti-Karsanti region in south-central Turkey, and the Kopdag area in north-central Turkey. The primary producer of chromite was Etibank, which operated three concentrators: at Karagedik, in the Fethiye region, with an annual capacity of 30,000 tons of concentrate per year; Sori, in the Guleman region, with an annual capacity of 30,000 tons of ore, and the Kefdag concentrator, also located in Guleman, Elazig Province, with an annual capacity of 75,000 tons per year. Etibank also operated the country's two ferrochrome smelters, at Antalya, where production capacity was 20,000 tons per year of low-carbon ferrochrome, and Elazig, where capacity was 50,000 tons per year of high-carbon ferrochrome.

Etibank was expanding its chromite production capacity by modernizing and upgrading the Kefdag concentrator. Outokumpu Oy of Finland was providing the equipment along with supervision and training services under a \$9 million contract awarded by Etibank. The expansion was expected to be completed in 1986. The purpose of the project was to increase the supply and quality of concentrate feed to the Elazig Ferrochrome Works, where production has averaged about 55% of capacity for the past several years. In conjunction with the project, Elkem AS of Norway was providing engineering services, and Outokumpu was providing the process technology to increase high-carbon ferrochrome production capacity from 50,000 to 150,000 tons per year under a \$33 million expansion project. Etibank and Outokumpu were also cooperating on marketing chromite, ferrochrome, and other Etibank products through a joint marketing company, AB Etiproducts Oy, which was to service mainly the Nordic countries.

Meanwhile, private sector chromite producers continued to experience difficulties brought on by weak demand and low prices for chrome ore and concentrate. Although Etibank had the considerable advantage of being able to produce ferrochrome with its mine output, which maintained a higher export value, many of the private sector producers were forced to close down in 1982 and 1983 when the price for chrome concentrate slipped below their minimum operating cost. Several of the private sector operators were considering cooperating on a joint venture concentrator or ferrochrome smelter, possibly with a U.S. company, in order to allow them to maintain production and improve the economics of their mines. Still, the strength of Turkey's chromite industry remained the private sector's ability to rapidly increase production by reopen-

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ing their mines when the price for ore and concentrate rises.

Copper.—Turkey's copper industry was undergoing a large-scale expansion and modernization program to improve both the quantity and quality of ore feed to the country's smelters. Problems in mining and milling have kept capacity utilization below 50% for the past several years, and in 1983, mine output represented 45% of total capacity, and smelter production, less than 30% of capacity. Etibank and Karadeniz Bakir Isletmeleri (KBI), owned 49% by Etibank, were the main producers of copper ore and concentrate, and the only producers of blister copper. All smelter production was sold to private sector copper refineries in and around Ankara and Istanbul. Only one of four copper refineries was owned by the Government. Copper production was centered around Ergani in east-central Turkey, Murgul in central Turkey, Kure on the Black Sea coast in central Turkey, and at Samsun-Ceyeli in northeastern Turkey. The country possessed approximately 125 million tons of measured plus indicated reserves of copper ore containing an average of 1.7% copper. Reserves at Turkey's operating copper mines were 65 million tons containing 1.5% copper.

Table 2.—Turkey: Copper industry in 1983

Operating company	Ownership	Location	Date established	Mine capacity (metric tons)	Mill capacity (metric tons)	Smelter capacity (metric tons)	Refinery capacity (metric tons)	Capacity utilization[e] (percent)
Mining and smelting:								
Etibank	Government.	Ergani	1939	1,050,000	90,000	16,000	--	30
Do	do	Murgul	1951	487,000	65,000	12,000	--	30
Karadeniz Bakir Isletmeleri (KBI).	Government-private.	do	1973	2,970,000	208,000	--	--	45
Do	do	Samsun	1973	--	--	40,800	--	25
Do	do	Kure	1972	94,000	--	--	--	45
Refining:								
Bakirson Electrolytic Copper Ltd.	Private	Duzce	1981	--	--	--	20,000	25
MKEK (Machinery and Chemicals).	Government.	Ankara	1928	--	--	--	3,000	50
Rabak Electrolytic Copper Ltd.	Private	Istanbul	1957	--	--	--	40,000	30
Sarkuysan Electrolytic Copper Ltd.	do	do	1975	--	--	--	40,000	30
Total				4,601,000	363,000	68,800	103,000	XX

[e] Estimated. XX Not applicable.

Several projects were underway in 1983 to improve the performance of the industry. KBI was in the process of expanding the open pit Murgul copper mine from 2.97 to 3.85 million tons per year of ore, under a $60 million contract awarded to Boliden Contech, which also includes modernization of the concentrator to handle the increased ore feed. Capacity expansion of this mine and mill was to be completed by 1985. Etibank, with assistance from Outokumpu, was expanding the open pit mine and commencing underground mining at Kure where ore production was expected to reach 1.1 million tons per year by 1986. A new concentrator was also being built with a capacity of 105,000 tons per year of 14% copper concentrate. KBI, which operates the underutilized Samsun smelter, was attempting to increase the feed to the smelter by constructing a new concentrator at the smelter site to handle ore produced from KBI's Bakibaba Mine at Kure, which had been the main source of ore for the smelter. The addition of Etibank's ore from the new mine at Kure was also expected to provide feed for the Samsun smelter. At Kutlular, near Trabzon, KBI was commencing copper mining and building a 16,000-ton-per-year concentrator capable of producing 16% copper concentrate, all of which was to be shipped to Samsun for smelting. This project was to be completed in 1984. KBI was also attempting to improve the efficiency of the Samsun smelter through another modernization project, which was expected to raise its blister production from the current level of just over 10,000 tons per year to 33,000 tons per year by 1986.

The showpiece in Etibank's attempts to encourage foreign investment in the mining industry was its joint venture with Phelps Dodge Corp. of the United States to develop the Cayeli copper deposit in northeastern Turkey. Diamond drilling and sampling by Phelps Dodge has established measured reserves of nearly 30 million tons containing 2.8% copper, 4.3% zinc, 0.038 troy ounce of gold per ton, and 1.83 troy ounces of silver per ton. Phelps Dodge has allocated another $3 million for exploration in 1984. A decline has already been completed, giving access to the deposit, and samples were being taken for metallurgical pilot plant studies. A feasibility study and cost estimate was in progress with an expected minimum mining rate of 2,000 tons of ore per day. The production goal for the operation was 62,000 tons per year of copper concentrate, 41,000 tons per year of zinc concentrate, and 206,000 tons per year of pyrite concentrate. The copper was to be smelted at existing facilities with the pyrite roasted for sulfuric acid production. Phelps Dodge holds 49% of the equity of the project, with Etibank holding 45% and Gama Industries TAS, a private Turkish company, holding the remainder. Preussag AG of the Federal Republic of Germany has also formed a joint venture with Etibank to study mining copper in Siirt in southwestern Turkey, where reserves were estimated at 20 million tons of copper ore of unspecified grade.

Iron Ore.—Iron ore production began to recover in 1983, reaching its highest level since nationalization of the industry in 1978. In 1983, the Government passed legislation returning most of the country's iron ore mines to their former private owners in an attempt to stimulate production. With more of its capital and work force concentrated on its largest mines at Divrigi, Etibank was able to substantially increase production of iron ore. Output was expected to increase further as the private sector mines renew their operations and commence production. Because of the 45% increase in iron ore production from the domestic mines, Turkey was able to substantially reduce its imports of iron ore, which were over 1 million tons in 1982.

Iron and Steel.—Turkish steelmakers also made a substantial recovery in 1983, led by robust growth in the private sector, while capacity utilization in the state-owned mills remained low. Steel production was divided roughly 70% by the Government and 30% by the private sector, but rapid growth of the private sector and the construction of new minimills and metalworking plants was likely to shift that ratio more in favor of the private companies.

Table 3.—Turkey: Primary steel producers in 1983

Operating company	Ownership	Location	Date established	Annual capacity (metric tons)	Product	Process
Turkiye Demir ve Celik Isletmeleri (TDCI).	Government	Karabuk	1939	1,600,000	Raw steel	Blast-LD converter.
Do	do	Iskenderun.	1939	1,100,000	do	Do.
Metas Izmir Metalurji Fabrikasi TAS.	TDCI-private	Izmir	1956	360,000	do	Do.
Eregli Demir ve Celik Isletmeleri.	do	Eregli	1960	1,800,000	do	Do.
Kroman Celik AS	do	Gebze	1966	50,000	do	Do.
Colakoglu Metalurji AS	Private	Izmit	1969	400,000	do	Do.
Istanbul Celik ve Demir Izabe Sanayii AS.	do	Istanbul	1973	100,000	do	Do.
Asil Celik Sanayii TAS	Private-Government.	Bursa	1974	210,000	Specialty steel.	Do.
Cukurova Celik Endustrisi AS	do	Aliaga	1981	350,000	Raw steel	Do.
Total				5,970,000		

Source: Iron and Steel Works of the World. Metal Bulletin (London), 8th ed., 1984.

In addition to the primary steel producers, there are approximately 15 private sector merchant mills, rerollers, tube and pipe mills, and other fabricating operations that supplied the domestic market. Among these, Izmir Demir Celik Sanayii AS (IDC) was to become the newest producer of raw steel when its electric arc furnace minimill and rolling mill commence operating sometime in 1985. IDC was already one of the larger producers of bars and rods in the private sector. The Government sector, after delaying expansion projects for several years, renewed its efforts to bring its three large steel plants up to capacity. At the Karabuk works, where capacity utilization averaged 91% in 1983, a modernization program was undertaken to upgrade the coking, sinter, and powerplant. The largest expansion project was taking place at Turkiye Demir ve Celik Isletmeleri's (Turkish Iron and Steel Works) Iskenderun works, where annual crude steelmaking capacity was to double to 2.2 million tons by 1985. In addition, Eregli was also raising capacity from 1.8 to 2 million tons per year.

Turkey's domestic steel industry was protected through most of 1983 by a 15% import tax levied on European Economic Community steel in retaliation for its duties on Turkish textiles. Exports of iron and steel rose 11% to $365 million compared with those of 1982. The rise was due largely to a 200,000-ton sale of steel products to Iran for the first time. However, while Turkish imports of iron ore went down because of the surge in domestic output, imports of scrap for the smaller private melting shops rose strongly, which resulted in an overall deficit in Turkey's iron and steel trade.

Tungsten.—Etibank's Wolfram Mine at Uludag continued to operate below capacity owing to problems with the concentrating process and the quality of ore feed. The mine produced mostly scheelite, but some wolframite was produced from an underground mine located at the summit of Uludag Mountain, 42 kilometers south of Bursa. An open pit mine on the deposit has been closed since 1980 after enough ore was stockpiled at the concentrator. When it did operate, the pit was shut down for over one-half year owing to the heavy snowfalls at its 2,500-meter elevation. Tungsten reserves were placed at 9.4 million tons measured grading 0.35% WO_3 and another 4.9 million tons indicated. The concentrator, initially a combination of dry crushing and grinding and magnetic separation for scheelite, and wet grinding and magnetic separation for wolframite, was modified after a few years of poor operation to an all wet-grinding circuit, which has been modified further to mostly gravity separation by tabling. The feed to the concentrator was reduced to accommodate this process from a planned 550,000 tons of ore per year to below 200,000 tons per year. Etibank was experimenting with a flotation process pilot plant to improve ore feed rates and quality of the concentrate, but the flotation flowsheet has yet to be adopted to the main concentrating plant. Etibank was considering forming a joint venture with a foreign company in order to bring the plant up to capacity.

NONMETALS

Barite.—Turkey's barite industry continued to expand, led by an increase in production capacity by the country's leading producer and exporter, Bastas Barytes Industry and Trading Co. Inc., located at Antalya on the Mediterranean coast. Bastas brought its first grinding plant on-stream in 1976 and quickly became the country's most prominent producer. Raw barite was supplied to the plant from Bastas' own mines on the Black Sea coast near Trabzon, where reserves were estimated at 2 million tons; near Kutahya, where reserves were 400,000 tons; and also along the Mediterranean coast in scattered deposits between Alanya and Iskenderun, where about 1 million tons of barite reserves have been established. Bastas was able to supply 60,000 tons of lump barite from its own mines to the grinding plant, while another 50,000 tons was purchased from Etibank, which was one of the largest mine producers of lump barite. Another 30,000 tons of raw barite was supplied by other private local producers.[4]

Bastas was in the process of doubling its barite grinding capacity to 240,000 tons per year, while Etibank was constructing its own grinding plant, also at Antalya, with an annual capacity of 50,000 tons. Several smaller scale private companies produced barite in Turkey, which they ground in their own plants or sold to one of the larger companies for grinding. Since 1976, when the Government prohibited the export of raw barite in order to force producers to install grinding equipment, grinding capacity in Turkey has increased to over 700,000 tons per year. Total barite reserves in the country were estimated at 10 million tons.

Boron.—The rapid growth of boron output in Turkey between 1978 and 1981 began to taper off in 1982 and 1983, owing primarily to weak demand worldwide and the generally low level of domestic consumption. Some expansion programs from this earlier period had yet to be completed in 1983, especially production facilities for boron chemicals, which should increase the overall value of boron exports in the future. Boron was already the country's leading mineral export, and priority was being given to developing export markets for refined boron chemicals. As part of Turkey's new mining ownership law, all former private sector producers have until January 1, 1985, to sell whatever output or stocks of boron they possess, after which time Etibank was to be the sole supplier of boron minerals. Etibank, which nationalized all the mines in 1978, produced 98% of the country's total output in 1983, so the law was basically designed to ensure Etibank marketing control over all production.

Boron was mined from five separate deposits in Turkey, while refined products were produced at two locations, Bandirma, and Kirka, which was still under construction.

Table 4.—Turkey: Boron mining industry in 1983

Mine location	Ore mineral	Average B_2O_3 content (percent)	Production capacity (thousand metric tons)	Ore reserves[e] (thousand metric tons)
Bigadic	Colemanite	42	250	200,000
Do	Ulexite	37	80	50,000
Emet	Colemanite	41	450	300,000
Espey	do	41	60	50,000
Kestelek	do	41	100	100,000
Kirka	Tincal	33	300	300,000
Total		XX	1,240	1,000,000

[e]Estimated. XX Not applicable.

Turkey possessed the world's largest reserves of boron minerals, about 60% of the world total, and was second only to the United States in production capacity, output, and exports. Etibank was planning to expand boron chemical exports through construction of a new chemical plant and transportation facility at Kirka, and expansion of its existing facilities at Bandirma. The Kirka plant was to be capable of producing annually 160,000 tons of borax pentahydrate, 60,000 tons of anhydrous borax, and 17,000 tons of borax decahydrate. Construction of the facility was completed in 1983, and production was scheduled to start early in 1984. The Bandirma plant's annual production capacity of 35,000 tons of boric acid, 35,000 tons of borax pentahydrate, 55,000 tons of borax decahydrate, 20,000 tons of sodium perborate, and 120,000 tons of sulfuric acid was to be augmented by a new 100,000-ton-per-year boric acid plant to be completed by 1985. A high-capacity wharf was also built at Bandirma to load ships directly from railway cars for export.[5]

Cement.—Cement production capacity was rising rapidly in Turkey, as two of seven new plants being built by the state-owned Turkiye Cimento Sanayii TAS (Cisan) came on-stream in 1983. At Ladik, near Samsun on the Black Sea coast in northeastern Turkey, a 580,000-ton-per-year clinker plant commenced production, as did a 595,000-ton-per-year clinker plant at Adiyaman. Cisan's five other plants under construction were a 580,000-ton-per-year cement plant at Diyarbakir and a 590,000-ton-per-year cement plant at Siirt, both scheduled for completion in 1984; a 552,000-ton-per-year plant at Urfa expected on-stream in 1985; and a 550,000-ton-per-year facility at Edirne and a 600,000-ton-per-year plant at Denizli, both scheduled for completion in 1986. Completion of these facilities would raise Cisan's total number of cement plants to 26, almost all of which have a production capacity of about 400,000 to 600,000 tons per year. In addition to these new plants, Cisan in 1983 expanded the capacity of its Erzurum plant by 170,000 tons per year and installed a new 175,000-ton-per-year cement mill at its plant in Gaziantep.[6]

There were approximately 20 privately owned cement plants in Turkey, and these remained responsible for about 60% of the country's total output. These plants were generally larger than the public sector operations, and capacity utilization also tended to be higher. Total production capacity in Turkey was to reach 24.5 million tons when these plants were completed, which would provide a large exportable surplus. Cement consumption in Turkey was estimated at 13 million tons per year in 1983.

Fertilizer Materials.—The modernization of Turkey's fertilizer plants was continuing under the second phase of the Government's fertilizer energy saving and rationalization project, assisted by a $44 million loan from the International Bank for Reconstruction and Development (World Bank) granted in 1982. Akdeniz Gubre Sanayii AS was using a major portion of the loan to upgrade and modernize its sulfuric acid, phosphoric acid, and diammonium phosphate (DAP) plant at Mersin. Other recipients of the loan were Ege Gubre, which was upgrading its ammonium sulfate facility at Foca, and Gubre Fabrikalari, which was installing a new 600-ton-per-day DAP plant at its sulfuric and phosphoric acid facility in Iskenderun.

Istanbul Gubre Sanayii awarded a contract to Uhde GmbH of the Federal Republic of Germany to increase ammonia production to 1,100 tons per day while reducing energy consumption 26% at its Istanbul ammonia plant. Azot Sanayii TAS, the Government-owned fertilizer producer, was receiving World Bank assistance for the rehabilitation of its 92,000-ton-per-year ammonia plant at Kutahya. This project was to also result in expansion of capacity and reduction of energy consumption.[7]

Magnesite.—Turkey was one of the top five producers of magnesium compounds in the world. Most of the country's magnesite was produced from deposits in central and western Anatolia, around Kutahya, Eskisehir, Konya, and Kumbet. The largest producer of magnesite was Continental Madencelik Sanayii ve Ticaret (Comag), which specialized in producing caustic-calcined magnesia from its own mines in Kumbet. Comag has recently expanded its production of high-purity, fusing-grade magnesia. The three leading producers of dead-burned magnesite were Kutahya Manyezit Isletmeleri (Kumas), Manyezit AS, and Sumerbank. Kumas was doubling its production capacity from 72,000 to 140,000 tons per year of dead-burned magnesite in 1983. Most of Kumas' sales from its operation in Kutahya were to the Soviet Union. Sumerbank, which operates out of Konya, produced magnesite for its own refractory production. Production of crude magnesite ore in Turkey peaked in 1982 at 905,000 tons, but declined to below 740,000 tons in 1983.

MINERAL FUELS

Increasing production of primary energy was a top priority of Turkey's new Government. Domestic energy production fulfilled only 60% of the country's requirements, with the remainder being made up for by imports of oil, natural gas, and electricity. Turkey imported 84% of its crude oil needs and 8% of its total electricity consumption. Of the total energy produced in Turkey, hard coal and lignite-fired powerplants provided 32%, petroleum and liquid fuels supplied approximately 25%, and hydropower provided the largest share, about 43%. Petroleum's share continued its decline, while lignite and hydropower were expanding rapidly.

Most of the country's energy sector was controlled by a number of Government-owned SEEs, among them Turkiye Komuleri Isletmeri, the Turkish coal company responsible for hard coal and lignite production; Turkish Electricity Authority, responsible for constructing thermal power stations at the lignite mines; TPAO, the state oil company; and the State Hydraulic Works (DSI), which constructs hydropower plants. DSI was in the process of constructing 14 dams and hydroelectric powerplants that were to add 14.5 billion kilowatt hours to the nation's current electricity production of 28 billion kilowatt hours. In addition to these, the Attaturk Dam, being planned as one of the country's alltime largest construction and energy projects, was expected to produce, at full capacity with eight generating units operating, 8.1 billion kilowatt hours of electricity per year by 1984. In December 1983, Turkey announced a $2.9 billion program to develop its nuclear power generating capacity and was evaluating proposals by United States, West German, and Canadian companies to provide the country with its first nuclear reactor.

Coal.—Production of hard coal and lignite continued to grow at a rapid rate, boosted by the Government's policy of encouraging the use of coal and lignite for both home heating and industrial use despite the pollution problems it creates, especially in urban areas. Of the total coal produced, 12% of the hard coal was consumed in thermal power stations, while 53% of lignite production was consumed for this purpose. About 50% of bituminous coal production was consumed in coking plants for use in the steel industry, with the remainder used for heating and industrial fuel. Turkey continued to import hard coal for coking, although imports have declined considerably as domestic output rises.

The Government was strongly behind the effort to develop energy produced from lignite-fired thermal powerplants. Turkey's reserves of lignite were conservatively estimated at 8 billion tons, and the Government was planning to construct 15 new lignite-fired thermal powerplants, raising lignite consumption from 11 million tons per year to nearly 46 million tons per year by 1988.

Coal mining began at the first and largest of these new projects in 1983, when coal was exposed at 60 meters depth in the Afsin-Elbistan Coalfield in eastern Turkey. The opencast mine was expected to produce 20 million tons of lignite per year, which was to be supplied to a 1,200-megawatt power station at the minesite, scheduled to begin producing electricity in early 1985. Also in 1983, the U.S. Eximbank approved a guarantee on the sale of $217 million worth of U.S.-made mining equipment to the Government of Turkey.

Natural Gas.—Natural gas was also gaining in importance in Turkey's overall energy picture. Nonassociated gas production was increasing from the Thrace region, that part of Turkey on the European side of the Bosporus. Gas was being produced at Devecatagi, Eskitasli, Hamitabat, Kepirtepe, Turgutbey, Umurca, Vakiflar, and Yesigol, all located in Thrace. In the Hamitabat region, 18 gas wells were being connected to a distribution station, from which pipelines were being laid to local industries. Gas from the area already powers the Pinarhisar cement plant and was soon to be used in the Thrace glass factory. Commercial quantities of gas were also found in six of seven wells drilled in the Umurca region. Studies were underway to link all the Hamitabat gasfields to the Anbarli thermal power station, which currently consumes imported fuel oil, and then extending the pipeline through Istanbul to the Ismit industrial zone and then to Gemlik. The World Bank was assisting TPAO in the gas exploration and development project with a $55 million loan. Total gas production from the region averaged only about 4 million cubic feet per day, but the World Bank and TPAO both expressed optimism about finding as much as 1 trillion cubic feet of gas in the Thrace Basin. Turkey was negotiating with the Soviet Union to import Soviet natural gas through a planned pipeline through Bulgaria at the rate of 141 billion cubic feet per year. The project remained in the planning stage. Turkey was also planning to import natural gas liquids (NGL) from Iraq via a planned 3-million-ton-per-year pipeline from Kirkuk, Iraq, to Yumurtalik. Snamprogetti S.p.A. of Italy was awarded the $1.2 million contract for a feasibility study, design, and engineering of the pipeline. Construction was expected to begin in 1984.

Petroleum.—*Production.*—Production of crude oil continued to decline to an average of 43,200 barrels per day from nearly 46,000 barrels per day in 1982. The Turkish Government was attempting to reverse this trend by encouraging oil exploration by its own company, TPAO, as well as foreign companies. In March 1983, Law 2808 was passed, containing substantial new incentives for production and exploration. Oil producers were allowed to export 35% of all oil and gas produced onshore and 45% of oil and gas produced offshore from areas discovered after January 1, 1980. In addition, crude oil and refined product exports were free of export duties and taxes, and foreign exchange earnings from exports could be held outside the country. The royalty on oil production by foreign companies was 12.5%, and in joint ventures, the production split with TPAO for the foreign company could range from 30% to 49%.

The oil producing companies in Turkey were NV Turkse Shell, a subsidiary of Royal Dutch/Shell of the Netherlands, which produced the largest share of the output estimated at 47% of the total; TPAO, which produced about 42% of the total; Mobil Exploration Mediterranean, a subsidiary of Mobil Oil Corp. of the United States, which produced 10% of Turkey's crude; and Ersan Petroleum Corp. of Turkey, which operated a single field and was responsible for the remaining 1%. Total recoverable oil reserves were placed at 370 million barrels in 1983.

Exploration.—Exploration activity remained fairly stable in 1983, with TPAO leading the foreign companies in acreage and well activity. Foreign companies active in exploration included Huffco Turkey Inc., a subsidiary of Roy M. Huffington Co. of the United States, which drilled its first well on a 1.6-million-acre concession shared with Pogo Turkey Inc. and Hispánica de Petróleos S.A. of Spain, Wintershall AG of the Federal Republic of Germany and its partner Aladdin Middle East, and several smaller companies, including Barrick Petroleum Corp., Seahawk Oil Co., and Lennox Oil Co., which began seismic work in 1983. NV Turkse Shell made a significant strike in 1983 in the Keryan Field near Diyarbakir. The test well reportedly flowed at 1,000 barrels per day, and the field contained an estimated 1 million barrels of recoverable reserves.

Refining.—Total existing petroleum refining capacity in Turkey was 170 million barrels of crude oil input from four refineries. TPAO owned and operated two of the refineries, the 90,000-barrel-per-day Aliaga refinery near Izmit, and the 20,000-barrel-per-day facility at Batman. The 90,000-barrel-per-day Anadolu Tasfiyehanesi AS refinery was also owned by TPAO after being nationalized in 1978, but operation of the plant was conducted by former owner Mobil on behalf of TPAO. The fourth and largest refinery was the Istanbul Petrol Rafinerisi Anomin Sirketi facility at Izmit, which was capable of handling 270,000 barrels per day of crude oil. Total refined product output in Turkey averaged 346,600 barrels per day in 1983, nearly 75% of total capacity, a significant improvement from that of previous years.

TPAO was in the process of constructing a new refinery at Kirikkale in central Anatolia with a capacity of 60,000 barrels per day. Industrialexport of Romania was responsible for construction of the plant, which was to process crude oil from Iraq lifted from the Yumurtalik terminal of the Kirkuk to the Iskenderun (Botas) pipeline. Completion was scheduled for 1986.

Petrochemicals.—Construction of the Turkish Petrochemical Corp.'s second petrochemical complex was nearing completion in 1983. The first plant, located at Yarimca, was brought on-stream in 1970. The new plant, located at Aliaga, near TPAO's refinery, was to produce annually 105,000 tons of vinyl chloride monomer, 100,000 tons of polyvinyl chloride, 500,000 tons of ethylene, 150,000 tons of polyethylene, 124,000 tons of benzene, 70,000 tons of terephthalic acid, 60,000 tons of polypropylene, 40,000 tons of polyethylene, 54,000 tons of ethylene oxide, and 30,000 tons of phthalic anhydride, along with other chemicals. Approximately 10 Turkish and foreign companies were involved in the design, engineering, and construction of the plant, which was scheduled for completion in 1984.

Pipelines.—The first stage of the expansion of the crude oil pipeline from the Kirkuk oilfields in Iraq to Yumurtalik in the Gulf of Iskenderun on the Turkish Mediterranean coast was completed, raising throughput capacity from 700,000 to 900,000 barrels per day. This was Turkey's main source of imported crude oil and Iraq's only remaining export terminal. The line was to be expanded further to over 1 million barrels per day. A 450-kilometer pipeline was being constructed from the Yumurtalik tank farm to Kirikkale, to supply TPAO's new refinery with Iraqi oil. Snamprogetti was designing another pipeline from Kirkuk to Yumutalik, this one to carry 3 million tons per year of NGL to Turkey and for export. Turkey and the Soviet Union were also considering construction of a 141-billion-cubic-feet-per-year pipeline from the Soviet Union through Bulgaria to Thrace and Istanbul to supply Turkey's gas needs, but no decision on building the pipeline had been made at yearend.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Turkish lira (TL) to U.S. dollars at the rate of TL202.7 = US$1.00.

[3] General Directorate, Mineral Research and Exploration Institute. Brief Summary of Turkish Chromites. Ankara, Turkey, June 1984.

[4] Watson, I. Bastas Doubles Barytes Capacity at Antalya. Ind. Miner. (London), No. 186, Mar. 1983, pp. 55-57.

[5] Dickson, T. Borates in Turkey. Ind. Miner. (London), No. 195, Dec. 1983, pp. 63-65.

[6] Rock Products. V. 87, No. 4, Apr. 1984, p. 52.

[7] Nitrogen (London). No. 148, Mar.-Apr. 1984, p. 12.

The Mineral Industry of the U.S.S.R.[1]

By Richard M. Levine[2]

The U.S.S.R. occupies approximately one-sixth of the world's land surface and accordingly, contains large resources and reserves of most materials. In 1983, it was also one of the largest mineral producing and consuming countries in the world. The U.S.S.R. was self-sufficient in minerals except for a small number of commodities and was a large exporter of minerals. It was one of the world's largest producers of mineral commodities including aluminum, asbestos, cement, chrome ore, coal, copper, diamonds, gold, iron ore, lead, manganese ore, natural gas, nickel, petroleum and petroleum products, phosphate rock, platinum-group metals, potash, steel, sulfur, tin, and zinc.

In the iron and steel sector, production increased, following production decreases in 1982; increases were reported for the production of crude steel, iron ore, finished rolled steel, and steel pipe. Natural gas production continued to increase at a rapid rate, and oil production continued to slowly increase. Coal production decreased for the fourth time in the last 5 years. Cement production rose, after falling in 1982, and mineral fertilizer production registered a sharp increase, but still fell short of the plan. It was reported that production increased for a number of nonferrous metals, but actual figures were not reported. The 1983 plan for the extraction of antimony, bauxite, lead, mercury, molybdenum, nickel, rare-earth metals, tin, and zinc was reported fulfilled.

In the nonferrous sector, it was calculated that about 50% of the useful ore components were not recovered and that about one-half of this loss was economically unjustified. To ensure a more complete utilization of ore components, it was recommended that equipment should be added to the operating units and that prices should be set to make byproduct recovery more profitable.[3]

Mineral Industry Technology.—The Soviets were engaged in drilling the world's deepest hole in the Kola Peninsula 9 miles north of Zapolyarnyy near the coast of the Barents Sea. The hole was to reach a depth of 15,000 meters and in 1983 was near 12,000 meters. Twenty more extra-deep holes were planned. Those planned in West Siberia, the Pechora and Caspian Sea Basins, and the Krasnodar and Poltava regions were intended for oil and gas exploration.

The concern was expressed that it was necessary to organize research within the U.S.S.R. Academy of Sciences on the problems of seabed mining. Research was being conducted by small groups in industrial research institutes and technical schools that, it was stated, were not keeping pace with new technology.[4] It was reported that the Soviet research ship *Morskoy Geolog* would prospect for commercially viable offshore deposits of iron and manganese.

The Soviet mining industry had to deal with continually decreasing ore grades. In iron ore mining, the average iron content of ore decreased during the last 30 years from over 50% to between 30% and 35% and was continuing to decrease. In addition, during the last 30 years the average tin content of ore decreased by two-thirds, and the average copper, lead-zinc, molybdenum, and tungsten content of ore decreased by one-half. Insufficient production of flotation reagents caused slowdowns in concentration of nonferrous ores including lead-zinc and tungsten-molybdenum ores. There was a general shortage of flotation reagents such as sodium sulfide, sodium cyanide, butyl xanthate, activated coke, and thiourea.[5]

A major way of reducing raw material expenditures would be to economize on the use of steel in machine manufacturing. In the 18 machine-building ministries, during 1970-82, the average amount of steel wasted was 28% of the total steel allocated. The amount of steel wasted during this time increased from 13.8 million tons per year to 20.7 million tons per year.[6]

A lack of state-of-the-art equipment was said to be hampering exploration; there was a shortage of high-quality drilling equipment and drive pipes and also transport for workers to reach remote areas. Renovation of the Barnaul geological equipment plant was said to be lagging.[7]

The Soviet Union was developing autogenous smelters for use in nonferrous metallurgy, including the Kivcet CS smelter and the PZhV or fluidized bed smelter. Many difficulties had been encountered with these smelters in moving from experimental to production units.[8]

The Soviets intended during the 11th 5-year plan, 1981-85, to introduce 600 robots into the iron and steel industry in blast furnace, steel smelting, and rolling operations. However, little had been done to build these automated devices. Iron and steel metallurgy enterprises were accused of not being prepared to introduce such innovations, and the Ministry of Ferrous Metallurgy, the Ministry of Heavy and Transport Machine Building, and the Ministry of the Machine Tool and Tool Building Industry were faulted for not engaging in the necessary research for creating such robots. The use of robots, it was stated, would help, in part, to alleviate the country's labor shortage.[9]

PRODUCTION

Statistics on output, enterprise capacity, and production plans in physical units of output for nonferrous, precious, and rare metals and some nonmetallics were classified as state secrets. Soviet trade data on precious metals have not been available for decades, and in 1976, the Soviets stopped publishing trade statistics for nonferrous metals. Production and trade data were available for some ferrous metals and some nonmetallics.

Still, some information was available on most mineral commodities that could be used to determine the relative size or growth of the mineral industry. However, Soviet information had to be carefully qualified. Making comparisons with Western countries regarding production, consumption, production costs, labor productivity, etc., would be difficult owing to the great difference in economic systems.

Secondary Production.—About 50% of the steel and over 20% of nonferrous metals were produced from secondary materials. During the past 10 years, the procurement of scrap for nonferrous metal production increased 57%, including a 77% increase for aluminum, 77% for copper and its alloys, 43% for lead, 131% for titanium, and 33% for zinc.[10] Production of alloys based on secondary materials increased 60% during the 1970-82 period.[11] Still, many nonferrous constituents in processed scrap were not recovered, and the quality of processed scrap was declared to be low. The 1983 plans for the collection and processing of secondary nonferrous metals and for secondary steel collection were reported fulfilled. Still the complaint was raised that ferrous and nonferrous scrap was not being steadily provided to metallurgical facilities, enabling them to engage in uninterrupted production, but rather that scrap was all sent at the end of the month or plan period, in a practice referred to as "storming" the plan.[12]

Production Plans.—In 1984, oil and gas condensate production was planned to increase 1.3% to almost 4.6 billion barrels per year, and natural gas production was to increase 7.8% to about 20.4 trillion cubic feet per year. Oil and gas condensate production from West Siberia was planned to reach almost 2.9 billion barrels per year or 62% of the national output, and natural gas production in West Siberia was planned to reach 2.3 trillion cubic feet or 54% of the national output. Coal production was planned to increase 1% to 723 million tons, and rolled ferrous metals and steel pipe production were to increase only slightly. The plan called for an increase in copper, nickel, aluminum, and other nonferrous metals production and an increase in the use of secondary raw materials.

Table 1.—U.S.S.R.: Estimated[1] production of mineral commodities[2]

(Thousand metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983[p]
METALS					
Aluminum:					
Ore and concentrate:					
Bauxite, 26% to 57% alumina	4,600	4,600	4,600	4,600	4,600
Nepheline concentrate, 25% to 30% alumina	2,500	2,500	2,500	2,500	2,500
Alunite ore, 16% to 18% alumina	600	600	600	600	615
Alumina	2,600	2,700	2,800	3,000	3,200
Metal, smelter:					
Primary	1,750	1,760	1,800	1,850	2,000
Secondary	[r]160	[r]170	[r]180	[r]190	200
Total	[r]1,910	[r]1,930	[r]1,980	[r]2,040	2,200
Antimony, mine output, recoverable metal content tons	8,200	8,200	8,600	9,000	9,200
Arsenic, white (As_2O_3) do.	7,700	7,700	7,750	7,800	7,900
Beryllium: Beryl, cobbed, 10% to 20% BeO do.	1,800	1,800	1,800	1,850	1,900
Bismuth, mine output, recoverable metal content do.	72	72	75	78	80
Cadmium metal, smelter do.	2,850	2,850	2,900	2,950	3,000
Chromium: Chrome ore, crude	[3]3,200	[3]3,400	[3]3,300	[r]3,300	3,400
Cobalt:					
Mine output, recoverable metal content tons	2,000	[r]2,100	[r]2,200	[r]2,300	2,400
Metal, smelter do.	3,800	4,200	[r]4,300	[r]4,300	4,500
Copper:					
Ore:					
Gross weight, 0.5% to 2% Cu	126,000	127,000	128,000	131,000	135,000
Metal content, recoverable	855	900	940	970	1,000
Metal:					
Blister:					
Primary	930	970	1,030	1,070	1,100
Secondary	90	95	[r]100	[r]110	115
Refined:					
Primary	870	910	960	1,000	1,030
Secondary	170	170	170	170	170
Gold, mine output, metal content thousand troy ounces	8,160	8,300	8,425	8,550	8,600
Iron and steel:					
Iron ore, 55% to 63% Fe[3]	241,738	244,713	242,417	244,411	245,000
Iron ore, metal content[3]	131,453	132,885	131,071	132,055	132,400
Agglomerated products:[4]					
Sinter	157,427	153,818	154,657	151,846	151,000
Pellets	44,012	50,894	54,023	55,826	59,800
Metal:					
Pig iron and blast furnace ferroalloys:					
Pig iron for steelmaking[3]	101,255	99,958	100,576	99,700	103,000
Foundry pig iron[4]	7,000	6,600	6,600	6,400	6,700
Spiegeleisen[5]	50	50	50	50	50
Ferromanganese[5]	550	550	550	550	650
Other blast furnace ferroalloys[4]	100	100	--	--	--
Total[3] [6]	108,998	107,283	107,766	106,723	110,400
Electric-furnace ferroalloys	2,400	[r]2,500	2,600	[r]2,700	2,800
Steel, crude[3]	149,099	147,941	148,445	146,165	153,000
Semimanufactures:[4]					
Sections	38,716	38,483	38,285	37,700	NA
Wire rods	7,989	8,066	7,877	7,880	NA
Pipe stock	6,040	6,020	6,122	6,245	NA
Tubes from ingots	1,880	1,976	1,917	1,848	NA
Plates and sheets:					
More than 5 millimeters thick	13,592	13,700	NA	NA	NA
Other	19,682	19,700	NA	NA	NA
Total	33,274	33,400	NA	NA	NA
Strip	11,475	10,898	11,010	10,220	NA
Railroad track material	3,971	4,137	3,900	4,131	NA
Wheels, tires, axles	1,068	1,115	1,084	1,014	NA
Unspecified shapes for sale	633	725	NA	NA	NA
Other and unspecified	71	70	59	63	NA
Total semimanufactures[6]	105,117	104,878	104,880	104,151	NA
Selected end products:					
Total pipes and tubes[3]	18,185	18,169	18,268	17,944	18,700
Cold-rolled sheet[4]	7,019	6,887	7,551	7,808	NA
Electrical sheet[4]	1,152	1,173	1,136	1,113	NA
Cold-reduced strip[4]	477	500	NA	NA	NA

See footnotes at end of table.

Table 1.—U.S.S.R.: Estimated[1] production of mineral commodities[2] —Continued

(Thousand metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983^{p}
METALS —Continued					
Lead:					
Mine output, recoverable metal content	415	420	425	430	435
Metal, smelter:					
Primary	475	475	480	485	490
Secondary	215	^{r}225	^{r}235	^{r}245	255
Magnesium metal including secondary	72	75	78	81	83
Manganese concentrate:[3]					
Gross weight	10,244	9,750	9,150	9,821	10,400
Metal content	3,162	3,040	2,761	2,957	3,100
Mercury metal including secondary 76-pound flasks	61,000	62,000	63,000	64,000	64,000
Molybdenum, mine output, metal content tons	10,200	10,400	10,700	11,000	11,100
Nickel:					
Mine output, metal content	151	154	158	^{r}165	170
Metal, smelter	165	172	178	180	188
Platinum-group metals, mine output, metal content thousand troy ounces	3,200	3,250	3,350	3,500	3,600
Silver metal including secondary do.	46,000	46,000	46,500	^{r}46,900	47,100
Tin:					
Mine output, recoverable metal content tons	35,000	36,000	36,000	37,000	37,000
Metal, smelter:					
Primary do.	37,000	38,000	^{r}37,000	^{r}38,000	38,000
Secondary do.	12,000	12,000	12,000	12,000	12,000
Total do.	49,000	50,000	^{r}49,000	^{r}50,000	50,000
Titanium:					
Concentrates:					
Ilmenite do.	410,000	420,000	425,000	430,000	435,000
Rutile do.	10,000	10,000	10,000	10,000	10,000
Metal do.	36,000	37,000	38,500	40,000	41,000
Tungsten concentrate, metal content do.	8,700	^{r}8,700	^{r}8,700	^{r}9,000	9,100
Vanadium do.	9,000	9,500	9,500	9,500	9,500
Zinc:					
Mine output, recoverable metal content	770	785	790	800	805
Metal:					
Primary	800	815	820	830	835
Secondary	80	80	^{r}85	^{r}90	95
Zirconium metal	75	75	75	80	80
NONMETALS					
Asbestos	2,020	2,070	2,105	2,180	2,250
Barite	500	510	510	520	520
Boron minerals and compounds:					
Gross weight	200	200	200	200	200
B_2O_3 content	40	40	40	40	40
Bromine	66	67	68	68	68
Cement, hydraulic[3]	123,019	125,049	127,169	123,681	128,000
Clays: Kaolin including china clay	2,500	2,500	2,500	2,500	2,600
Corundum, natural tons	8,500	8,600	8,600	8,600	8,700
Diamond:					
Gem[7] thousand carats	^{r}3,700	^{r}3,750	^{r}3,600	^{r}3,600	3,800
Industrial do.	^{r}7,000	^{r}7,100	^{r}7,000	^{r}7,000	7,200
Total do.	10,700	10,850	10,600	^{r}10,600	11,000
Diatomite	225	230	230	235	235
Feldspar	310	310	320	330	330
Fluorspar	520	520	530	540	560
Graphite	^{r}80	^{r}80	^{r}70	^{r}75	80
Gypsum	^{r}4,900	^{r}4,900	^{r}4,900	^{r}4,900	4,900
Iodine	2	2	2	2	2
Lime, dead-burned	^{r}28,000	^{r} [3]28,400	^{r} [3]28,400	^{r} [3]28,700	[3]29,500
Lithium minerals, not further specified	50	55	55	60	60
Magnesite:					
Crude	^{r}4,600	^{r}4,700	^{r}4,800	^{r}4,900	5,000
Marketable product	^{r}2,300	^{r}2,350	^{r}2,400	^{r}2,450	2,500
Mica	46	46	47	48	49
Nitrogen: N content of ammonia	12,200	12,400	^{r}12,600	12,800	13,000
Perlite	360	360	360	360	360

See footnotes at end of table.

Table 1.—U.S.S.R.: Estimated[1] production of mineral commodities[2] —Continued

(Thousand metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983[p]
NONMETALS —Continued					
Phosphate rock:					
Crude ore:					
Apatite, 15% P_2O_5	44,700	[3]46,500	[3]46,400	[3]48,000	49,000
Sedimentary rock	24,150	[3]24,800	25,400	26,000	26,300
Total	68,850	71,300	71,800	74,000	75,300
Concentrate:					
Apatite, 39.4% P_2O_5	17,200	17,900	18,000	18,300	18,500
Sedimentary rock, 19% to 25% P_2O_5	7,200	7,400	7,600	8,400	8,500
Total	24,400	25,300	25,600	26,700	27,000
Potash:					
Ore, gross weight	50,000	[3]60,800	63,000	[r]66,000	76,000
K_2O equivalent[3]	6,635	8,064	8,449	8,079	9,300
Pyrites, gross weight	7,800	7,900	8,000	8,100	8,100
Salt, all types[3]	14,300	14,600	15,200	15,800	16,200
Sodium compounds, n.e.s.:					
Sodium carbonate[3]	4,782	4,780	4,860	4,763	4,800
Sodium sulfate:					
Natural	340	350	350	360	360
Manufactured	240	250	250	250	250
Sulfur:					
Frasch	800	800	800	800	800
Other native	1,900	2,000	[r]2,000	[r]1,900	1,800
S content of pyrites	3,500	3,550	3,600	[r]3,600	3,600
Byproduct:					
Of coal	40	40	40	40	40
Of metallurgy	[r]700	[r]800	[r]800	[r]800	800
Of natural gas	[r]2,100	[r]2,200	[r]2,250	[r]2,300	2,350
Of petroleum	200	200	200	200	200
Total	9,240	9,590	[r]9,690	[r]9,640	9,590
Sulfuric acid[3]	22,364	23,033	24,095	23,801	24,700
Talc	480	490	500	[r]510	510
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Hard coal (anthracite and bituminous)[3]	553,960	552,954	544,213	555,400	554,000
Lignite and brown coal[3]	164,704	163,417	159,831	162,700	162,000
Total[3] [8]	718,664	716,371	704,044	718,100	716,000
Coke: Coke oven beehive, breeze, gas coke	86,000	86,000	86,000	86,000	86,000
Fuel briquets:					
From anthracite and bituminous coal	650	600	600	[r]600	600
From lignite and brown coal	6,777	6,185	[r]6,200	[r]5,800	5,700
Total[3]	7,427	6,785	6,800	6,400	6,300
Gas, natural, marketed:					
As reported[3] million cubic meters	406,597	435,217	465,262	500,700	536,000
Converted million cubic feet	[r]14,360,000	[r]15,369,000	[r]16,430,000	[r]17,700,000	19,000,000
Oil shale	36,000	[r] [3]37,389	[r] [3]36,928	[r] [3]35,236	[3]33,256
Peat:					
Agricultural use	225,000	[3]235,000	[3]280,000	300,000	300,000
Fuel use	60,000	60,000	60,000	60,000	60,000
Petroleum:					
Crude:					
As reported, gravimetric units[3]	585,571	603,207	608,820	612,600	616,000
Converted, volumetric units thousand 42-gallon barrels	[r]4,304,000	[r]4,433,600	[r]4,475,800	[r]4,500,000	4,530,000
Refinery products[4] [9]	424,897	436,588	445,590	453,200	460,000

[p] Preliminary. [r] Revised. NA Not available.

[1] Production estimated unless otherwise specified.

[2] Includes data available through Oct. 5, 1984.

[3] Reported in Soviet sources.

[4] Reported in United Nations sources.

[5] Estimate based on total of spiegeleisen and blast furnace ferromanganese reported by United Nations sources.

[6] Data may not add to totals shown because of independent rounding.

[7] Series changed to include near gem and cheap gem quality.

[8] Run-of-mine coal. The average ash content of coal shipped from mines was 20.2%, and the average calorific value was slightly more than 5,000 kilocalories per kilogram (9,000 British thermal units per pound in 1977).

[9] Not distributed by type and, therefore, not suitable for conversion to volumetric units. Data include all energy products and some nonenergy products as well as refinery fuel and exclude petrochemical feedstocks, paraffin, petroleum coke, white spirit, unspecified minor nonenergy products, and refinery losses.

TRADE

Foreign trade was administered according to the national plan by the Ministry of Foreign Trade and its subordinate foreign trade organizations. Enterprises were not allowed to engage in foreign trade except through foreign trade organizations. Laws of comparative advantage played less of a role in foreign trade than did Government objectives. Two major Soviet objectives were to integrate the economies of Eastern Europe with the Soviet economy and to earn sufficient hard currency to purchase essential commodities such as grain and advanced technology and equipment. Mineral exports were used to meet both objectives. The Soviet Union was the chief supplier of fuel and other raw materials to Eastern Europe, and mineral exports provided the majority of Soviet hard currency earnings.

Regarding major hard-currency-earning mineral exports, in 1983 the Soviet Union maintained its high 1982 level of petroleum exports to the West. This was partially achieved through increased reexport of Middle East and North African crude obtained in barter exchanges. Soviet gold exports, however, fell to about 60 tons, their lowest level since the 1971 demonetization of gold.

The Soviet Union signed contracts with Japanese firms to import high-carbon and alloy steel products including boiler tubes and stainless steel seamless pipes. Four Japanese firms signed an agreement to ship 1 million tons of large-diameter steel pipe to the U.S.S.R. in 1984. The Soviet Union also ordered 500 sideboom tractors from Komatsu Ltd. for use on the trans-Siberian gas export pipeline. Although Japan was to import over 3 million tons per year of coking coal from the Neryungri complex in Yakutia starting in 1983, the Soviets were not able to deliver this amount. The Soviets also reduced the price of all coking coal sold to Japan by over 18%, in accord with world prices. Despite reported reductions in palladium sales to Europe and the United States, there was no decrease in palladium sales to Japan.

India and the U.S.S.R. signed a protocol for the U.S.S.R. to provide technical and financial assistance for the development of several Indian coalfields and an agreement to cooperate in gold mining and other mineral development in India. The U.S.S.R. also agreed to take all 600,000 tons of alumina from the proposed Andhra Pradesh refinery, twice what they had previously agreed to take. The Soviets would continue to take 600,000 tons per year until a proposed associated smelter was completed.

The Soviet Union and China signed an agreement stipulating a large increase in trade. Regarding minerals, the Soviet Union was to supply China with steel products, nonferrous metals, and cement and was to receive unspecified minerals from China. The U.S.S.R. was to export ferroalloys to China as part of this agreement.

North Korea was increasing its exports to the U.S.S.R. of nonferrous metals, magnesite, and cement. According to a 1983-85 trade agreement, the U.S.S.R. was to supply Laos with petroleum products and rolled ferrous metals.

In Africa, the U.S.S.R. purchased manganese concentrates from Gabon despite the fact that the U.S.S.R. was the world's largest producer of manganese and a leading manganese exporter. Imported concentrates were reported to have a high manganese content.

In the Middle East, the U.S.S.R. signed an agreement to assist Iraq in developing hydroelectric power and in exploiting Iraq's oil and gas reserves. The Soviet Union was also assisting Libya in developing its oil and gas reserves and was providing technical assistance and equipment for the construction of a 570-kilometer gas pipeline.

The past 2 years witnessed big increases in Soviet imports of Middle East and North African crude oil, most of which was reexported. The Soviets exchanged armaments and other goods in barter arrangements for the crude oil. Imports from Libya during the first half of 1983 jumped to 140,000 barrels per day from 60,000 barrels per day for the corresponding period in 1982. Iran and Iraq supplied the U.S.S.R. with a further 90,000 barrels per day, and Syria supplied the U.S.S.R. with 14,000 barrels per day.

In October, it was announced that the European Economic Community (EEC) had rescinded the provisional 7% antidumping duty imposed in June on Soviet nickel imports, and that the antidumping duty collected since June was to be refunded. The Soviet state trade organization Raznoimport had challenged the EEC's duty, which was imposed after complaints by European nickel producers. The Soviet case was strengthened when it appeared that the

Soviet price was being undercut by other producers. The EEC complaint also gave rise to a controversy during this period concerning the proper method for evaluating Soviet nickel imports, a large percentage of which was shipped as uncut cathodes.

In other actions, in June the EEC imposed an antidumping duty on copper sulfate originating in the Soviet Union. The EEC also confirmed a provisional antidumping duty imposed in November 1982 on soda ash imported from the Council for Mutual Economic Assistance (CMEA)[13] Eastern European countries and the Soviet Union and extended its antidumping procedure regarding imports of nonalloy crude aluminum from the Soviet Union, while a final ruling regarding Soviet aluminum dumping was awaited.

The Federal Republic of Germany's Mannesmann AG stated it was holding talks with the Soviet Union on the sale of surface mining and coal processing equipment to develop Siberia's vast lignite reserves. The project, if agreed upon, would be the largest East-West business transaction since the agreement to build the trans-Siberian gas pipeline. The proposed project called for transforming the lignite into synthetic liquid fuels for shipment to the western industrialized region of the Soviet Union. By gaining access to Siberia's vast lignite reserves, the Soviet Union would be able to achieve its goal of greater substitution of coal for oil, freeing petroleum for export and petrochemical use. Other proposals for gaining access to Siberia's low-quality coal reserves included construction of trans-Siberian coal slurry pipelines and construction of large thermal electric powerplants near the deposits connected to long-distance electricity transmission networks. It was not certain yet which project or combination of projects would be undertaken because the decision rested on a number of factors, including cost, technological feasibility, access to Western technology, equipment, credits, etc.

The Soviet Union signed an agreement with Ruhrgas AG of the Federal Republic of Germany to supply West Berlin with natural gas from the trans-Siberian export pipeline. Deliveries were scheduled to begin in 1985 and were to increase over a period of several years to 23 to 25 billion cubic feet per year. The contract was to run until the year 2008. The agreement involved construction of a 235-kilometer spur pipeline from the Czechoslovak border through the German Democratic Republic. West Berlin had been dependent on coal and oil for the majority of its energy needs. Although shipments to West Berlin would only slightly help the Soviets achieve their gas export goal, it would be significant for Berlin's energy supply. Total West German imports of Soviet oil and natural gas increased in 1983.

The Federal Republic of Germany's Thyssen Rheinstahl Technik GmbH received an order for a rolling mill for the Krivoy Rog steelworks in the Ukraine. The mill, scheduled for completion in 1985, would make seamless steel rings for use in the manufacture of turbines. The Federal Republic of Germany's Mannesmann Demag AG signed a contract to construct two pipe plants in the Soviet Union; one would be in Baku on the Caspian Sea and the other in Taganrog on the Sea of Azov.

Austria signed a protocol for the receipt of Soviet gas from the trans-Siberian pipeline beginning in 1984. It would be in addition to the large amount Austria was already importing from the Soviet Union.

Italy's state-run contracting and engineering group, Italimpianti, a subsidiary of Finsider S.p.A., the state-controlled steel holding company, was awarded a contract by the Soviet Union to build five coal processing plants, each with a capacity of 15 million tons per year, at the Ekibastuz Coalfields in Kazakhstan. The Soviets planned eventually to construct 10 coal processing plants at Ekibastuz. Finsider received orders from the Soviet Union for 800,000 tons of steel pipe. The contract was to be filled by the end of 1984.

France signed a 5-year trade agreement with the Soviet Union that, among other provisions, would triple Soviet imports of French steel products. The new agreement would help reduce France's trade deficit with the Soviet Union, caused, in part, by increased purchase of Soviet natural gas.

In Soviet trade with other Western European countries, the Belgian seamless and specialized tube maker, Tubemeuse, won an extension of its current major export contract with the U.S.S.R. The U.S.S.R. and Norway signed an agreement for planning exploration of oilfields in the Barents Sea. The Soviet Union agreed to provide 50% of the cost of constructing a 600,000-ton-per-year alumina refinery in Greece with the Soviets tentatively scheduled to purchase 380,000 tons per year of alumina for a 10-year period.

In an effort to reduce its trade surplus with the Soviet Union, Finland increased its oil imports from the Soviet Union by 3.3 million barrels above its originally agreed upon purchase of 58.8 million barrels per year. Finland also agreed to import an additional 9.6 million barrels of Soviet crude oil for resale on the world market.

Yugoslavia signed an agreement to purchase an additional 7.4 million barrels of Soviet oil, raising Yugoslavia's imports of crude oil from the Soviet Union to 47.8 million barrels per year. The Soviet Union signed an agreement to supply Yugoslavia with mining and other equipment for renovation of lead-zinc mining and metallurgical enterprises.

United States-Soviet trade comprised a small percentage of the total trade turnover of both countries. In United States-Soviet trade, mineral commodities comprised a small percentage of U.S. exports and a large percentage of U.S. imports. Certain commodities traded were of significance to the economies of the importing countries such as palladium from the Soviet Union and phosphoric acid from the United States. The level of trade in certain important mineral commodities, such as chrome ore, gold, molybdenum, titanium, etc., had varied considerably over the years. In August 1983, the United States removed all licensing requirements for exports of heavy pipelaying equipment to the Soviet Union. This opened the way for the U.S. Caterpillar Tractor Co., which had lost much of its Soviet business to Japan's Komatsu Ltd., to try to resume this trade. Complaints were raised by U.S. producers that the Soviet Union was exporting large quantities of urea to the United States at prices below U.S. production costs.

In November, the third shipment in 1983 of Soviet 50% ferrosilicon arrived in the Port of New Orleans; these were the first Soviet ferrosilicon shipments in 9 years. U.S. ferrosilicon producers were concerned that these imports severely threatened the domestic market because the 50% grade was their main product. The U.S. International Trade Commission decided to conduct an investigation to determine whether the Soviet ferrosilicon imports caused market disruptions.

In December, the U.S. Government issued a ban on all imports from the U.S.S.R. of unfabricated nickel and nickel-bearing materials containing Cuban nickel. The U.S.S.R. would have to follow procedures already in effect for other countries certifying that nickel-bearing exports contained no Cuban material. This ruling could result in a ban of all Soviet nickel imports because it could be assumed that nickel from the U.S.S.R. had some Cuban nickel in it unless the U.S.S.R. made satisfactory certification to the contrary. The U.S. Customs Service would detain any nickel-bearing material imported either directly or indirectly from the U.S.S.R. until its country of origin was ascertained. The ban on Soviet nickel imports did not affect stainless steel or other fabricated products containing Soviet nickel such as flatware, pots, and pans from outside the Soviet Union. U.S. imports of Soviet nickel during the first 9 months of 1983 had risen 84% in comparison to the same period in 1982 partly because, it was speculated, of the EEC's 7% duty on Soviet nickel that was imposed from June through October 1983. In 1982, Soviet nickel imports accounted for 3% of total U.S. nickel imports.

Table 2.—U.S.S.R.: Mineral trade with the United States in 1983

(Metric tons unless otherwise specified)

Commodity	Quantity
Leading U.S. exports:[1]	
Oil, insulating or transformer ... barrels	261,436
Petroleum coke, calcined	26,272
Phosphoric acid, 65% or more available phosphorus pentoxide equivalent	729,905
Leading U.S. imports:[1]	
Ammonia, anhydrous	582,861
Ferrosilicon, 39% to 60% silicon, silicon content	7,029
Fuel oil, light, 25° API or more ... barrels	221,063
Limestone, crude, broken or crushed, for use in fertilizer manufacture	33,763
Nickel, unwrought	4,009
Platinum-group metals (metal content):	
Palladium ... kilograms	10,842
Palladium bars, plates, etc ... do	1,264
Platinum bars, plates, etc ... do	203
Platinum-group metals and combinations, n.e.s ... do	168
Platinum sponge ... do	236
Rhodium ... do	489
Potassium chloride, crude	61,519
Uranium compounds, fluorides ... kilograms	9,731
Urea, n.e.s	351,063

[1] Items selected based on dollar value.

The U.S.S.R. and Mexico agreed to undertake joint research in petroleum production and exploration. Research would be conducted in areas such as the development of drilling technology, oil and gas transport, and exploration techniques. Upon selecting concrete programs, an exchange of technical information was to commence in the last quarter of 1983. Although apparently not part of the agreement, the Soviets reportedly discussed publicly the possibility of Mexico supplying part of Cuba's oil needs in exchange for the U.S.S.R. supplying an equivalent amount to Mexico's clients elsewhere in the world.

The Soviet Union announced the completion of economic negotiations in Moscow with the Nicaraguan Government concerning, in part, the development of Nicaragua's mining industry and mineral exploration. These negotiations were in pursuance of a bilateral agreement signed in 1982 in Moscow to provide Soviet help for developing Nicaragua's mineral industry. Such assistance was in keeping with the Soviet pattern of providing aid for mineral development to friendly and developing countries to promote closer political and economic ties and to secure needed raw materials. The mining industry in Nicaragua was comprised essentially of gold and silver mining.

One of the U.S.S.R.'s main political objectives was to integrate the economies of the Eastern European CMEA countries (Bulgaria, Czechoslovakia, the German Democratic Republic, Hungary, Poland, and Romania) with that of the Soviet Union, and Soviet mineral trade played a major role in fulfilling this objective. Eastern Europe was deficient in most minerals while the Soviet Union was one of the world's largest mineral producers.

The Soviet Union provided the Eastern European countries with the majority of their raw material import requirements in nonhard currency transactions; the Soviet Union received in exchange manufactured and other goods. Only Romania of the six Eastern European countries did not obtain the majority of its raw material imports from the Soviet Union. Given the shortage of hard currency in the Eastern European countries, it would be difficult for these countries to purchase minerals on the world market if Soviet supplies were curtailed. Even Romania, which was the only Eastern European country with substantial oil production, had been turning more toward trade with the Soviet Union as its hard-currency situation deteriorated.

One alternative to Soviet supplies that was being pursued by the Eastern European countries was to assist mineral development in developing countries in exchange for minerals. This policy would serve the additional purpose of extending Soviet bloc influence in different parts of the world while also freeing Soviet mineral production for domestic use or for sale in the West for hard currency.

Still, the overwhelming majority of Eastern European mineral import requirements were met by the Soviet Union. Conversely, the Soviet Union did not depend to any appreciable extent on Eastern Europe for minerals. Some of the surplus raw materials produced by Eastern Europe, such as potash from the German Democratic Republic and copper from Poland, were exported to the West for hard currency.

The Soviet Union did import some raw materials from Eastern Europe, such as coal and sulfur from Poland, alumina from Hungary, and possibly some lead from Bulgaria, but these imports did not comprise a significant percentage of Soviet consumption. Furthermore, the Soviets exported to Eastern European countries commodities that they imported from other countries in the same area. Thus, the Soviets also exported coal, lead, and sulfur to Eastern Europe, and exported aluminum back to Hungary in exchange for the alumina as well as exporting aluminum to other Eastern European countries.

It was not possible to specify the exact amount of Eastern European dependency for many Soviet minerals because Soviet trade statistics for nonferrous and precious metals, steel, ferroalloys, and some fuel and nonmetallic minerals were a state secret. Occasionally an Eastern European country would publish figures on trade with the Soviet Union in a mineral that the Soviet Union did not report, but in general, both sides maintained the rule of secrecy. However, prior to 1976, the Soviets did publish more information on mineral trade including trade in a number of nonferrous metals, and these figures from earlier years could be used to gauge the degree of Eastern European dependency. The fact that this dependency did not change could be confirmed by observing the trading patterns of the Eastern European countries with the countries of the Western world from which trade information always was available.

To present an idea of the scope of Eastern European mineral dependence on the Soviet

Union, trade for a certain number of representative minerals is presented in the following tables. Similar relationships held true for many other minerals not included in the following tables. Although the data in the tables are listed as being for the year 1981, the Soviets planned on maintaining this 1981 level of exports to Eastern European CMEA countries through the 1981-85 period with only minor variations, particularly regarding oil and natural gas.

Table 3.—U.S.S.R.: Selected raw materials exports to Eastern European CMEA countries in 1981

Commodity	Percent of		
	Total U.S.S.R. exports	Total Eastern European imports	Eastern European consumption
Aluminum	73	88	50
Chrome ore	56	77	73
Copper	95	71	28
Iron ore	96	71	63
Lead	87	78	51
Manganese ore	94	80	69
Natural gas	57	100	35
Petroleum	49	81	73
Phosphate rock	79	57	40
Zinc	89	52	52

Table 4.—U.S.S.R.: Selected raw materials imports from Eastern European CMEA countries in 1981

Commodity	Percent of		
	Total Eastern European exports	Total U.S.S.R. imports	U.S.S.R. consumption
Alumina	56	27	8
Coal, bituminous	18	100	0.7
Sulfur	19	85	8
Zinc	17	10	1

In 1983, the Soviet Union agreed to maintain oil exports to CMEA countries at the 1982 level. Shipments of chrome ore to Czechoslovakia and Poland were reduced. Hungary and the U.S.S.R. renewed and expanded their aluminum cooperation agreement until 1990. The earlier Soviet-Hungarian aluminum agreement, concluded in 1962, was due to expire in December 1985, when the new agreement would take effect. According to the terms of the new agreement, Hungary was to increase its annual supply of alumina to the Soviet Union from 330,000 to 530,000 tons per year and to ship to the Soviet Union 5,000 tons per year of aluminum semimanufactured goods. Hungary was also to receive in exchange 205,000 tons per year of aluminum instead of the former 165,000 tons. Elsewhere, the U.S.S.R. shipped to Bulgaria a 1-million-kilowatt atomic reactor from the Izhora works in Leningrad. This was the first of several units of this type that were to be shipped to the CMEA countries. The U.S.S.R. assisted Romania in putting into operation two caustic soda plants and was assisting Bulgaria in the development of the Asarel copper and molybdenum complex and the Yrma-reka lead and zinc mining and beneficiation complex.

Table 5.—U.S.S.R.: Estimated production, trade, and consumption of mineral commodities in 1983

(Thousand metric tons unless otherwise specified)

Commodity	Production	Imports	Exports	Apparent consumption
METALS				
Aluminum:				
Bauxite	4,600	4,600	--	9,200
Nepheline concentrate	2,500	--	--	2,500
Alunite	615	--	--	615
Alumina	3,200	1,500	--	4,700
Metals:				
Unwrought and semimanufactured	2,000	(1)	600	1,400
Secondary	200	--	70	130
Antimony tons	9,200	1,000	400	9,800
Arsenic, white (As_2O_3) do.	7,900	--	50	7,850
Beryllium, 10% to 20% BeO do.	1,900	(1)	(1)	1,900
Bismuth do.	80	200	--	280
Cadmium do.	3,000	50	50	3,000
Chrome ore	3,400	--	[2]496	2,904
Cobalt tons	2,400	2,100	--	4,500
Copper:				
Mine output, metal content	1,000	125	(1)	1,125
Unwrought, unalloyed, semimanufactured	1,125	35	180	980
Secondary	115	(1)	(1)	115
Gold thousand troy ounces	8,600	--	1,930	6,670
Iron and steel:				
Iron ore	[2]245,000	(1)	[2, 3]42,805	202,195
Pig iron	[2]110,400	(1)	4,500	105,900
Steel:				
Crude	[2]153,000	(1)	800	152,200
Rolled	[2]107,000	9,000	6,000	110,000
Lead:				
Mine output, metal content	435	55	--	490
Primary	490	45	100	435
Secondary	255	--	--	255
Magnesium metal	83	--	3	80
Manganese concentrate	10,400	200	[2]1,079	9,521
Mercury 76-pound flasks	64,000	--	(1)	64,000
Molybdenum tons	11,100	2,000	(1)	13,100
Nickel:				
Mine output, metal content	170	15	--	185
Smelter production	188	--	35	150
Platinum-group metals thousand troy ounces	3,600	(1)	1,400	2,200
Silver do.	47,100	5,000	--	52,100
Tin:				
Mine output, metal content tons	37,000	1,000	--	38,000
Primary do.	38,000	17,000	--	55,000
Secondary do.	12,000	--	--	12,000
Titanium metal do.	41,000	--	3,500	37,500
Tungsten do.	9,100	6,900	(1)	16,000
Zinc:				
Mine output, metal content	805	30	--	835
Primary	835	65	80	820
Secondary	95	--	--	95
NONMETALS				
Asbestos	2,250	(1)	675	1,575
Barite	520	500	--	1,020
Cement	[2]128,000	[2]262	[2]2,279	125,983
Clays	2,600	(1)	300	2,300
Corundum, natural tons	8,700	--	1,500	7,200
Diamond:				
Gem thousand carats	3,800	(1)	2,800	1,000
Industrial do.	7,200	(1)	700	6,500
Diatomite	235	(1)	(1)	235
Feldspar	330	--	--	330
Fertilizer materials:				
Nitrogen: N content	13,000	100	3,500	9,600
Phosphatic rock	27,000	--	5,000	22,000
Potash, K_2O equivalent	9,300	--	1,900	7,400
Fluorspar	560	625	--	1,185
Graphite	80	(1)	5	75
Gypsum	4,900	(1)	150	4,750
Lime, dead-burned	[2]29,500	(1)	(1)	29,500
Magnesite, crude	5,000	800	30	5,770
Mica	49	7	--	56
Salt, all types	16,200	(1)	[2]339	15,861
Sulfur, all types	9,590	1,100	400	10,290
Sulfuric acid	[2]24,700	100	200	24,600

See footnotes at end of table.

Table 5.—U.S.S.R.: Estimated production, trade, and consumption of mineral commodities in 1983 —Continued

(Thousand metric tons unless otherwise specified)

Commodity	Production	Imports	Exports	Apparent consumption
NONMETALS —Continued				
Talc	510	15	(1)	525
MINERAL FUELS AND RELATED MATERIALS				
Coal:				
Anthracite and bituminous	554,000	9,000	27,000	536,000
Lignite and brown coal	162,000	20,000	(1)	182,000
Gas, natural million cubic meters	[2]536,000	4,000	62,000	478,000
Oil shale	[2]33,256	--	--	33,256
Peat:				
Agricultural	300,000	--	--	300,000
Fuel use	60,000	--	--	60,000
Petroleum:				
Crude	[2]616,000	13,000	130,000	499,000
Refinery products	460,000	1,000	45,000	416,000

[1] Less than 1/2 unit.
[2] Reported in Soviet sources.
[3] Includes concentrates.

Table 6.—U.S.S.R.: Net import reliance of selected minerals and metals as a percent of consumption in 1983

Commodity	Percent of consumption	Principal sources
Antimony	6	Yugoslavia.
Barite	49	Bulgaria, North Korea, Yugoslavia.
Bauxite and alumina	48	Greece, Guinea, Hungary, India, Jamaica, Yugoslavia.
Bismuth	71	Japan, Netherlands.
Cobalt	47	Cuba.
Fluorspar	53	China, Mongolia, Thailand.
Iron and steel, high-quality products	4	Belgium-Luxembourg, West Germany, Italy, Japan.
Magnesite	14	North Korea.
Mica	13	India.
Molybdenum	15	Mongolia.
Silver	10	Switzerland, United Kingdom.
Tin	33	Malaysia, Singapore, United Kingdom.
Tungsten	43	China, Mongolia.
Zinc	2	Australia, Finland, Peru, Poland.

Table 7.—U.S.S.R.: Net exports of selected minerals and metals as a percent of consumption in 1983[1]

Commodity	Percent of consumption
Aluminum	44
Asbestos	43
Chromium ore	17
Diamond, gem	280
Gas, natural	13
Gold	29
Iron ore and concentrate	21
Manganese ore	12
Nickel, smelter production	23
Nitrogen fertilizer	36
Petroleum, crude, and refinery products	38
Phosphate	16
Platinum-group metals	64
Potash	26
Titanium	10

[1] Selection made from commodities for which exports comprise 10% or more of consumption.

Table 8.—U.S.S.R.: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	[2]2,250	31,417	--	Poland 28,194.
Metal including alloys:				
Scrap	56,353	50,689	--	Austria 42,469.
Unwrought	360,905	430,458	1,696	Hungary 134,359; Japan 81,726; Czechoslovakia 55,000.
Semimanufactures	15,046	17,614	--	Yugoslavia 8,820; Poland 4,728.
Antimony: Oxides	122	416	--	Japan 240; Austria 83.
Chromium:[2]				
Ore and concentrate thousand tons	567	561	11	Poland 151; Czechoslovakia 146.
Oxides and hydroxides	5,154	4,026	17	West Germany 1,461; Yugoslavia 569.
Copper:				
Sulfate[2]	21,102	23,188	--	Bulgaria 8,000; Hungary 3,500.
Metal including alloys:				
Scrap	3,383	13,619	--	Austria 12,339.
Unwrought	47,619	59,118	894	Czechoslovakia 39,000.
Semimanufactures	402	762	--	Finland 324; Poland 152.
Gallium: Metal including alloys, all forms kilograms	200	NA		
Germanium: Metal including alloys, all forms do	212	49	--	All to Japan.
Gold: Metal including alloys, unwrought and partly wrought thousand troy ounces	1,495	1,688	12	Japan 1,039; West Germany 599.
Iron and steel:				
Iron and concentrate:				
Excluding roasted pyrite[2] thousand tons	54,429	42,836	--	Czechoslovakia 9,878; Poland 8,995; Romania 7,780.
Pyrite, roasted do	106	NA		
Metal:				
Scrap[2] do	2,681	2,859	--	Italy 872; Spain 400; Japan 369.
Pig iron, cast iron, related materials do	3,105	1,935	--	Czechoslovakia 900; Bulgaria 399.
Ferroalloys:				
Ferrochromium do	20	21	--	Hungary 6; Austria 5.
Ferromanganese do	24	26	--	All to Hungary.
Ferrosilicochromium do	--	1	--	All to Sweden.
Ferrosilicomanganese do	20	7	--	All to Finland.
Ferrosilicon do	17	24	--	West Germany 8; Hungary 8.
Unspecified do	8	14	--	Hungary 10; Sweden 3.
Steel, primary forms do	736	666	--	Hungary 357; Yugoslavia 183.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	1,166	1,463	--	Poland 673; East Germany 524.
Universals, plates, sheets do	1,033	974	--	East Germany 475; Hungary 241.
Hoop and strip do	20	14	--	Yugoslavia 10.
Rails and accessories do	2	2	--	Mainly to Yugoslavia.
Wire do	3	3	--	West Germany 1; Jordan 1.
Tubes, pipes, fittings do	40	51	--	West Germany 15; Poland 10.
Castings and forgings, rough do	1	10	--	Poland 8.
Lead:				
Oxides	--	25	--	All to Italy.
Metal including alloys:				
Unwrought	27,059	24,168	--	Czechoslovakia 15,000; Finland 7,010.
Semimanufactures	--	8	--	All to Yugoslavia.
Lithium: Oxides and hydroxides	423	380	--	Japan 290.
Magnesium: Metal including alloys, unwrought	37	528	--	West Germany 211; France 199.
Manganese: Ore and concentrate, metallurgical-grade[2] thousand tons	1,194	1,144	--	Poland 535; Czechoslovakia 346.
Mercury 76-pound flasks	464	1,044	--	Ethiopia 551; West Germany 406.
Nickel:				
Matte and speiss	804	481	--	Sweden 435.
Metal including alloys:				
Scrap	4	140	--	Sweden 117.
Unwrought	29,245	33,878	1,903	West Germany 12,996; France 6,003.
Semimanufactures	229	331	--	Yugoslavia 265.

See footnotes at end of table.

Table 8.—U.S.S.R.: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$126,918	$96,911	$37,961	West Germany $30,345; Switzerland $16,031.
Tin: Metal including alloys:				
Unwrought	--	25	--	All to Poland.
Semimanufactures	--	30	--	All to Malaysia.
Titanium:				
Ore and concentrate	--	25,909	--	All to Poland.
Oxides	21	NA		
Metal including alloys, all forms	1,504	1,148	306	West Germany 842.
Tungsten:				
Ore and concentrate	--	67	--	United Kingdom 38.
Metal including alloys, all forms	--	1	--	All to Italy.
Vanadium: Oxides and hydroxides	--	40	--	West Germany 20; Italy 20.
Zinc:				
Ash and residue containing zinc	--	231	--	All to West Germany.
Metal including alloys:				
Scrap	22	NA		
Unwrought	13,156	14,848	--	Czechoslovakia 9,000; Poland 5,417.
Semimanufactures	55	11	--	Greece 10.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	17	63	--	All to Finland.
Artificial:				
Corundum	745	1,371	--	All to West Germany.
Silicon carbide	2,297	3,223	--	West Germany 3,133.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$1,110	$949	$106	Yugoslavia $343; Italy $260.
Grinding and polishing wheels and stones[3]	1	50	--	Yugoslavia 21; Ethiopia 10.
Asbestos, crude	306,805	264,034	--	Poland 66,863; Japan 38,204; Czechoslovakia 35,443.
Boron materials:				
Crude natural borates	3,621	1,805	--	All to Japan.
Elemental	101	NA		
Oxides and acids	[2]14,558	[2]10,149	--	Japan 6,652; Hungary 2,045.
Cement[2] thousand tons	2,735	2,221	--	Egypt 475; Hungary 463; Afghanistan 335.
Clays, crude:				
Chamotte earth	1,493	NA		
Fire clay	5,861	NA		
Kaolin	28,662	44,618	--	Poland 39,942.
Unspecified	1,578	12,781	--	Yugoslavia 10,873.
Diamond:				
Gem, not set or strung value, thousands	$225,660	$332,484	$410	Belgium-Luxembourg $231,979; West Germany $44,977.
Industrial do.	$13,911	$708	--	All to Belgium-Luxembourg.
Fertilizer materials:				
Crude, n.e.s	153	NA		
Manufactured:				
Ammonia thousand tons	1,863	1,342	548	Finland 196; Italy 149.
Nitrogenous[2] do.	3,401	4,077	112	Cuba 578; Hungary 484; Vietnam 445.
Phosphatic[2] do.	753	690	--	Cuba 335; Bulgaria 160.
Potassic[2] do.	5,245	4,956	61	Poland 1,799; Hungary 609.
Unspecified and mixed do.	44	68	--	Austria 56; Egypt 9.
Graphite, natural	3,972	519	--	Poland 326; Japan 112.
Gypsum and plaster	43,917	25,000	--	All to Finland.
Magnesium compounds:				
Magnesite	7,505	6,256	--	All to Poland.
Oxides and hydroxides	10	NA		
Other	8,648	10,740	--	Finland 8,296.
Phosphates, crude thousand tons	3,921	3,535	--	Bulgaria 805; Poland 644; Hungary 473.
Phosphorus, elemental[2]	47,835	51,864	--	Poland 11,659.
Potassium salts, crude	1,608	2,083	--	All to Hungary.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$1,305	$7,153	$13	Switzerland $5,085; West Germany $1,801.
Synthetic do.	$611	$800	$6	Austria $343; Switzerland $184.
Pyrite, unroasted[2] thousand tons	536	359	--	Bulgaria 257; Hungary 51.
Salt and brine[2]	452,843	460,815	--	Hungary 150,090; Czechoslovakia 150,037.

See footnotes at end of table.

Table 8.—U.S.S.R.: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Sodium compounds, n.e.s.:				
Carbonate, manufactured	33,742	28,774	--	Finland 16,135; Yugoslavia 5,559.
Sulfate, manufactured[2]	51,305	46,053	--	Yugoslavia 17,151; Italy 7,894.
Stone, sand and gravel: Dimension stone:				
Crude and partly worked	15,407	16,372	--	Italy 7,043; West Germany 7,005.
Worked	15	28	(4)	Sweden 8; France 4.
Sulfur:				
Elemental: Crude including native and byproduct	43,506	25,491	--	Hungary 25,467.
Sulfuric acid[2]	179,912	197,060	--	Czechoslovakia 158,894.
Vermiculite, perlite, chlorite	64,336	74,361	--	Belgium-Luxembourg 41,804; France 17,554.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black[2]	107,861	106,823	--	Bulgaria 30,997; East Germany 22,258.
Coal:				
Anthracite and bituminous thousand tons	17,878	14,149	--	Bulgaria 5,330; East Germany 2,897; Yugoslavia 2,040.
Lignite including briquets do.	66	78	--	Yugoslavia 64.
Coke and semicoke do.	2,792	2,369	--	East Germany 1,055; Finland 671.
Gas, natural: Gaseous million cubic feet	1,463,512	1,551,318	--	Italy 324,756; Czechoslovakia 318,396; East Germany 225,695.
Peat including briquets and litter	171,371	169,243	--	France 33,697; West Germany 32,343.
Petroleum:				
Crude thousand 42-gallon barrels	740,561	535,734	--	East Germany 130,162; Poland 95,154; Finland 58,172.
Refinery products:				
Liquefied petroleum gas do.	933	1,912	--	West Germany 645; France 403.
Gasoline do.	39,904	38,912	269	West Germany 18,929; Netherlands 11,374.
Mineral jelly and wax do.	23	25	--	Finland 20.
Kerosine and jet fuel do.	2,759	2,720	--	Hungary 1,576; Netherlands 368.
Distillate fuel oil do.	101,058	102,725	--	Netherlands 24,200; Switzerland 17,014.
Lubricants do.	1,467	668	--	Denmark 446.
Residual fuel oil do.	44,644	82,453	1	Netherlands 18,392; Italy 11,486.
Petroleum coke do.	951	650	--	Japan 411; Italy 239.
Unspecified do.	21,308	15,539	--	All to Poland.

[p] Preliminary. NA Not available.

[1] Table prepared by Jozef Plachy. Owing to a lack of official trade data published by the U.S.S.R., this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2] Official Trade Statistics of the U.S.S.R.

[3] Excludes quantity valued at $1,134,000 in 1981 and $1,353,000 in 1982.

[4] Less than 1/2 unit.

Table 9.—U.S.S.R.: Apparent imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate thousand tons	3,286	1,003	--	Greece 566; Yugoslavia 354.
Oxides and hydroxides do.	916	761	(2)	Yugoslavia 503; Hungary 237.
Metal including alloys:				
Unwrought	511	9,088	--	Ghana 9,050.
Semimanufactures	10,130	7,823	(2)	Austria 3,035; West Germany 1,405.
Antimony:				
Oxides	--	12	--	All from West Germany.
Metal including alloys, all forms	820	NA		
Bismuth: Metal including alloys, all forms	80	131	--	Japan 86; Netherlands 45.

See footnotes at end of table.

Table 9.—U.S.S.R.: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982^{p}	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Cadmium: Metal including alloys, all forms	50	515	--	Japan 451; Italy 60.
Cobalt:				
Oxides and hydroxides kilograms	50	19	--	All from Japan.
Metal including alloys, all forms	38	7	--	France 5.
Columbium and tantalum:				
Ore and concentrate	13	170	--	All from Netherlands.
Metal including alloys, all forms, tantalum kilograms	--	40	--	All from Japan.
Copper:				
Ore and concentrate	97,516	91,659	82,548	Sweden 5,250.
Matte and speiss including cement copper	--	1,326	--	All from Cyprus.
Metal including alloys:				
Scrap	4,037	2,017	--	Japan 1,996.
Unwrought	15,036	1,626	--	All from Poland.
Semimanufactures	19,208	27,005	3	Poland 10,129; Yugoslavia 5,843.
Iron and steel: Metal:				
Scrap	21,434	24,448	748	Mongolia 23,700.
Pig iron, cast iron, related materials	5,301	4,514	--	Sweden 3,272.
Ferroalloys:				
Ferromolybdenum	38	63	--	All from Sweden.
Ferrosilicon	2,669	2,790	--	All from North Korea.
Silicon metal	25,803	10,573	--	Norway 10,572.
Unspecified	85	467	6	Austria 461.
Steel, primary forms	36,974	10,223	--	West Germany 8,098.
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	1,310	1,115	--	Poland 318; Japan 210.
Universals, plates, sheets do	2,726	2,740	1	West Germany 824; Japan 559; Austria 476.
Hoop and strip do	315	271	--	West Germany 177; Japan 39.
Rails and accessories do	(2)	(2)	--	Mainly from United Kingdom.
Wire do	27	27	(2)	Italy 9; Japan 5.
Tubes, pipes, fittings do	3,103	4,145	(2)	Japan 1,571; West Germany 1,076; Italy 706.
Castings and forgings, rough do	9	4	--	West Germany 1; Italy 1.
Lead:				
Ore and concentrate	97,494	14,800	--	All from Greece.
Oxides	7,594	4,871	--	West Germany 2,400; France 2,171.
Metal including alloys:				
Unwrought	34,659	28,131	--	Belgium-Luxembourg 12,735; Peru 7,258.
Semimanufactures	4,957	29	--	Yugoslavia 28.
Magnesium: Metal including alloys, semimanufactures	49	NA		
Manganese:				
Ore and concentrate, metallurgical-grade	148,165	4,000	--	All from Hungary.
Oxides	4,782	NA		
Mercury 76-pound flasks	--	58	--	All from Japan.
Molybdenum:				
Ore and concentrate	891	1,042	--	All from Netherlands.
Metal including alloys, all forms	25	16	6	Japan 10.
Nickel: Metal including alloys:				
Unwrought	1	NA		
Semimanufactures	84	332	4	Japan 241.
Silver:				
Ore and concentrate value, thousands	$1,571	$50,863	--	West Germany $27,737; United Kingdom $23,124.
Metal including alloys, unwrought and partly wrought do	$7	NA		
Tin:				
Ore and concentrate	396	2,231	--	All from Singapore.
Metal including alloys:				
Unwrought	5,795	3,709	--	Malaysia 3,700.
Semimanufactures	(2)	1	--	All from Yugoslavia.
Titanium:				
Oxides	2,381	2,109	--	West Germany 1,983.
Metal including alloys, all forms	--	3	--	Italy 2.
Tungsten:				
Ore and concentrate	651	1,205	--	Netherlands 618; United Kingdom 524.
Metal including alloys, all forms	62	56	4	Japan 52.

See footnotes at end of table.

Table 9.—U.S.S.R.: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Vanadium: Oxides and hydroxides	(3)	803	--	All from Finland.
Zinc:				
Ore and concentrate	75,682	25,614	--	Sweden 12,914; Greece 12,700.
Oxides	125	46	--	Italy 45.
Metal including alloys:				
Unwrought	26,098	33,002	--	Netherlands 12,268; Finland 9,901.
Semimanufactures	2,398	2,261	--	Poland 1,930.
NONMETALS				
Abrasives, n.e.s.:				
Artificial: Corundum	70	1,779	--	Hungary 1,778.
Grinding and polishing wheels and stones	3,384	2,384	84	Austria 617; Italy 531.
Barite and witherite	2,857	1,304	--	All from Yugoslavia.
Cement	[4]200,000	[4]254,000	--	Finland 59,040; Hungary 23,975.
Diamond:				
Gem, not set or strung value, thousands	--	$24	--	All from Belgium-Luxembourg.
Industrial do.	$294	$1,932	--	Belgium-Luxembourg $1,617.
Fertilizer materials: Manufactured:				
Ammonia	5	1	--	All from United Kingdom.
Nitrogenous	71,613	43,502	--	Afghanistan 43,300.
Phosphatic	[4]229,275	[4]141,155	--	Morocco 79,673; Yugoslavia 54,101.
Unspecified and mixed	12,750	165,638	--	Finland 150,786.
Fluorspar	111,869	65,600	--	All from Thailand.
Graphite, natural	43	22	15	France 7.
Magnesium compounds:				
Magnesite[4]	593,015	705,112	--	North Korea 491,719.
Oxides and hydroxides	6,250	28,648	--	All from Japan.
Other	940	NA		
Mica:				
Crude including splittings and waste	--	1	--	All from United Kingdom.
Worked including agglomerated splittings	4	NA		
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$88	$582	--	United Kingdom $480.
Synthetic do.	$1,039	$11	--	All from Austria.
Salt and brine	[4]100,342	102,016	--	Chile 102,012.[4]
Sodium compounds, n.e.s.: Carbonate, manufactured	476,154	469,558	--	Bulgaria 431,581.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	65	21,310	--	Hungary 21,255.
Worked	458	1,656	--	Italy 706; Yugoslavia 594.
Gravel and crushed rock	24,583	9,897	--	Finland 9,892.
Sulfur:				
Elemental:				
Crude including native and byproduct	927,185	846,032	28,032	Poland 818,000.
Colloidal, precipitated, sublimed	--	7	--	All from France.
Dioxide	101	61	--	Switzerland 60.
Sulfuric acid	80,247	89,589	--	Poland 89,269.
Talc, steatite, soapstone, pyrophyllite	12,936	10,995	--	Finland 7,570; Austria 3,423.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	[4]551	[4]392	64	United Kingdom 200.
Coal:				
Anthracite and bituminous thousand tons	3,834	8,870	--	Poland 8,869.
Lignite including briquets do.	18	16	--	All from Hungary.
Coke and semicoke do.	705	718	--	All from Poland.
Gas, manufactured million cubic feet	2	NA		
Gas, natural: Gaseous do.	339	336	--	All from Hungary.
Peat including briquets and litter	406	54	--	All from Finland.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	1	4	--	France 3.
Gasoline do.	6	3	--	Finland 2.
Mineral jelly and wax do.	(2)	3	--	All from West Germany.
Kerosine and jet fuel do.	347	256	--	Hungary 229.
Distillate fuel oil do.	277	542	--	Hungary 225; Sweden 168.
Lubricants do.	1,185	2,311	457	France 290; West Germany 254; Finland 244.
Nonlubricating oils do.	(2)	433	432	West Germany 1.

See footnotes at end of table.

Table 9.—U.S.S.R.: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982^p	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products —Continued				
Residual fuel oil thousand 42-gallon barrels	23	10	(2)	Italy 7.
Bitumen and other residues do	13	8	--	Hungary 7.
Bituminous mixtures do	18	31	--	Finland 30.
Petroleum coke do	1,004	1,132	1,040	Japan 92.

^p Preliminary. NA Not available.

[1] Table prepared by Jozef Plachy. Owing to a lack of official trade data published by the U.S.S.R., this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2] Less than 1/2 unit.

[3] 1981 imports valued at $3,541,000.

[4] Official Trade Statistics of the U.S.S.R.

COMMODITY REVIEW

METALS

Aluminum.—In 1983, the plan for bauxite extraction and aluminum production was reported fulfilled. The new rolling mill at the Kanaker aluminum plant in Armenia was reported working at full capacity, increasing plant output by 25%. At the Regar (Tadzhik) aluminum plant, potlines Nos. 11 and 12 were officially declared in operation, and the first output was reported from potline No. 11 in December. The new Soviet-developed potlines were declared to have 50% more capacity than the existing potlines. However, the complaint was raised that the new potlines, which were said to be state of the art, were being installed without sufficient testing or training of personnel.[14] It was planned to put a line for rolled output into operation at Regar during the first quarter of 1984; the plant was scheduled to reach its design capacity during the 12th 5-year plan (1986-90), but serious construction delays were reported.[15] Output at the Regar aluminum plant was reported to have increased 400% over the past 8 years. The Kirovabad plant in Azerbaidzhan, the only plant producing alumina from alunite, reported increasing production 2%.

Completion of the second stage of the Sverdlovsk aluminum alloy plant in Voroshilovgrad was announced in December; this would increase enterprise capacity by 25%. The first bauxite shipment was reported dispatched from the Belinskiy open pit of the Krasnooktyabr'skiy mining enterprise in Kustanay Oblast', Kazakhstan; the bauxite would be used to supply the Pavlodar aluminum plant and would augment depleted reserves from the Turgay Steppe.

The U.S.S.R. had to import almost 50% of its aluminum raw material requirements. Domestic reserves were being depleted, and new sources of domestic supply were of low-grade ore. Efforts to use nepheline syenite and alunite for aluminum production had not achieved wide success in application owing to technological problems. During the past 10 years, the procurement of scrap for aluminum production had increased 77%.[16]

At the Pavlodar aluminum plant in Kazakhstan, which was one of the country's largest alumina producers, it was discovered about a decade ago that reserves from the Turgay deposit, which supplied Pavlodar, were less than originally estimated. Production at Pavlodar had decreased owing to the depletion of these reserves and would decrease sharply in the future unless alternative supplies were forthcoming. Bauxite from the Kustanay deposit, which was being used to augment supplies from Turgay, had a high carbonate content and was one of the U.S.S.R.'s lowest quality bauxites. One part of Kustanay low-grade bauxite was being mixed with two parts of Turgay bauxite. To make further use of low-grade bauxite, major renovation at Pavlodar was initiated in 1981, the first phase of which was completed in July 1983; this amounted, however, to only one-fourth of the planned renovation for this period. Renovation was being hampered by a decrease in the allocation of investment funds for the plant. It was estimated that the plant would need an annual investment of 7 million rubles to prevent a decrease in alumina output, but the plant was currently receiving only 1.5 million rubles per year.[17]

The new Sayansk aluminum plant in Sayanogorsk, East Siberia, was scheduled to produce its first metal in 1984. Equipment was being supplied by French and West German companies. Plant capacity was reported by Western sources to be 500,000 tons per year, and the plant was reported to contain a 300,000-ton-per-year-capacity anode plant, a fluoride plant, and a semifabricating plant producing 100,000 tons per year of sheet, strip, and shapes; 50,000 tons per year of can strip; 50,000 tons per year of foil blanks; 25,000 tons per year of plastic coated metal; and 25,000 tons per year of foil. Energy was to be supplied from the Sayansk hydroelectric powerplant with alumina supplies coming from the Nikolayevsk, Kamensk, and other plants. Construction work on Sayansk was behind schedule.[18]

In foreign trade, Hungary and the U.S.S.R. renewed and expanded their aluminum production cooperation agreement. The current agreement, concluded in 1962, would expire in December 1985 when the new agreement would take effect and would continue until 1990. Under the new agreement, Hungary would increase its supply of alumina to the U.S.S.R. from 330,000 to 530,000 tons per year and would supply an additional 5,000 tons of semimanufactured aluminum goods. Hungary would receive in exchange 205,000 tons of aluminum instead of its former 165,000 tons. In 1984, the first stage of a large port complex was scheduled to be commissioned near Odessa on the Black Sea, and it would handle a significant part of the bauxite ore imported from Guinea.

The Soviet Union agreed to provide 50% of the cost of constructing a 600,000-ton-per-year alumina refinery in Greece, and the Soviets would purchase about 400,000 tons per year from the plant for a 10-year period.

The Soviet Union agreed to take all 600,000 tons per year of alumina from the proposed Andhra Pradesh alumina refinery in India. The Soviets had previously agreed to take 300,000 tons per year. The Soviets would continue taking 600,000 tons per year until a proposed associated smelter was completed.

Antimony.—The 1983 plan for antimony extraction was reported fulfilled. Renovation of the Kadamzhay antimony complex in Kirgiziya had resulted in more than doubling output. Along with increasing output, the Kadamzhay plant was commended for having sucessfully fulfilled its delivery plans over the course of many years. New capacity was reported put into operation at the Aznob (Dzhidzhikrutskiy) complex in Tadzhikistan. Rumors were circulating that Bolivia, in an apparent shift in its trading position, would begin exporting a large amount of its antimony production to the U.S.S.R.

Bismuth.—Bismuth was recovered as a byproduct of lead-zinc smelting in Kazakhstan and other areas of the Soviet Union from dust and crude metal at the Balkhash and Mednogorsk copper complexes and from tungsten and molybdenum ores. The Ust'-Kamenogorsk lead-zinc complex in Kazakhstan reported increasing byproduct production of bismuth.

Chromium.—In 1983, the Soviets reduced exports of chrome ore 17%, primarily by reducing exports to Czechoslovakia and Poland.

Cobalt.—During the past decade, there had been a significant increase in cobalt production, coupled with a significant increase in consumption.[19] Production of cobalt, along with nickel, during 1981-85 was planned to increase by more than 30%. Expansion of domestic output depended greatly on the rate of development at the Noril'sk complex. In 1983, the 1,500-meter-deep Taymyr Mine in the Talnakh area of the Noril'sk complex began operation. At the Nadezhda plant at Noril'sk between 1981 and 1982, the rate of recovery of cobalt from mixed sulfide concentrate increased from 70.5% to 80.6%. Difficulties were reported in fulfilling the plan for powdered cobalt production.[20]

Copper.—During the past 30 years, the average copper content of ore decreased 50%. During the past 10 years, the procurement of copper scrap increased 43%. During 1982 and the first quarter of 1983, there was a reported significant increase in the production of copper and copper alloys from secondary material.

In Kazakhstan, which contains about one-half of the total copper reserves and produced about 30% of the country's total output, the following developments were reported in 1983: Kazakhstan's 1983 plan for copper ore production was reported fulfilled. The Dzhezkazgan complex reported fulfilling its 1983 plan for copper production. The second stage of the Akchiy-Spasskiy open pit of the Severnyy (Northern) mining enterprise of Dzhezkazgan was put into operation. Problems were reported in increasing production to the desired level at the Yuzhnyy (Southern) mining enterprise of the complex.[21] The No. 3 concentration plant at Dzhezkazgan was scheduled to go into operation in 1984. At the Balkhash complex, the rolling mill put into operation (3 years ago) was planned to be working at design capacity, but was actually producing at only one-half of that. The problem was attributed to the slow pace of renovation of facilities, which affected the tempo of work at the rolling mill.[22] At the copper smelting plant at Balkhash, the reverberatory furnaces were being replaced by Soviet-developed autogenous smelters. At the Irtysh copper complex, a new copper smelting shop, which was put into operation on the site of a dismantled shop, was reported working at design capacity and would increase output of blister copper at Irtysh.

In the Urals, the Uchaly mining and beneficiation complex reported fulfilling ahead of schedule its 1981 and 1982 plans for ore extraction and the production of copper concentrates and reported exceeding its 1983 plan for processing copper-zinc ore. At the Sredneural'sk copper smelting plant, it was planned to install Soviet-developed autogenous smelters during 1981-85. In 1983, no success was made in expanding the copper ore base in the central Urals.[23]

At Noril'sk in East Siberia, the Nadezhda plant's Finnish-built flash smelter, which was put into operation in 1981, reportedly achieved its design capacity to process 650,000 tons per year of copper concentrate. Also, at Noril'sk, production reportedly began from the new Taymyr Mine in the Talnakh area.

In Armenia, new copper mining was reported in the Akhtala region. The ore was said to be richer in copper and easier to concentrate than ore currently exploited and would extend mining in the Akhtala region. The ore was sent to the Akhtala beneficiation plant and then to the Alaverdi smelter.

In the Georgian S.S.R., the Madneuli mining and beneficiation complex reported fulfilling its 1983 production plan. The Madneuli complex reported increasing production 6% during 1981-83, fulfilling its production goal for this 3-year period. Plans called for tripling output at Madneuli by 1990.

In Uzbekistan, the Almalyk complex did not fulfill its 1983 production plan, and there was a decrease in labor productivity compared with that of 1982.[24] Although from 1981 to 1983 the production capacity at Almalyk increased 15% through expansion and renovation, problems existed in utilizing this increased capacity. There were long delays in putting capacity into operation at the Altyn-Topkan ore directorate, the Uchkulach and Kalmakyr Mines, the copper concentration plant, and the copper smelting shop. At the end of 1983, the second stage of the plant for continuous casting and rolling was officially declared in operation at the Almalyk complex. The second stage of the copper concentration plant at Almalyk was scheduled to begin operation by the end of 1984; it would help process the additional raw material required to supply the new rolling mill. It was also planned to start construction of the second stage of the flash smelter and to expand the sulfuric acid plants.

The Erdenet copper and molybdenum complex in Mongolia, which was being developed by the Soviet Union, in November was officially declared working at its full projected capacity. Erdenet had a design capacity of 118,000 to 125,000 tons per year of contained copper in ore. All output from Erdenet was sent to the Soviet Union for processing.

Ferroalloys.—At the Chelyabinsk electric-furnace plant, the first output of ferrochrome silicon was reported from the No. 53 furnace complex. The Soviet Union was also expanding its ferromanganese capacity, having ordered six 120,000-ton-capacity electric furnaces from Japan for installation between 1980 and 1983. The Zestafoni ferroalloy plant in Georgia reported exceeding its 1983 production plan. In 1984, the Zestafoni plant planned to put into operation a new section for ferromanganese production with a capacity of 10,000 tons per year.

In late 1983, the U.S. International Trade Commission began an investigation into whether shipments of 50% ferrosilicon from the U.S.S.R. caused a market disruption or posed a threat to domestic industry. Since June, three shipments of Soviet 50% ferrosilicon totaling 16,647 short tons in gross weight entered the United States; these were the first such shipments in 9 years.

Gold.—It was announced in July that the head of the All-Union gold industry association, Soyuzzoloto, which administered the national production of gold, silver, and platinum-group metals, was relieved of his duties "for serious shortcomings in his work."[25] Soviet gold sales fell from 200 tons in 1982 to 60 tons in 1983, the lowest level of

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sales since the demonetization of gold in 1971. In 1981 and 1982, the rate of recovery for gold in mixed sulfide ores averaged 70%. However, at several metallurgical plants including the Zolotushinskaya, Blagodatskaya, Kadainskaya, and Klichinskaya, the rate of recovery for gold was only 25% to 30%. In contrast, at the Leninogorskaya plant it was 76% to 83%.[26]

The Yuzhno-Zaozerskiy placer mine in the Urals reported fulfilling its gold production plan for the past three 5-year plans and fulfilled its plan for ore extraction for the first 3 years, 1981-83, of the current 5-year plan. Construction of a gold mining complex in Kirgiziya was planned to start in 1984. A previous reference to the development of a gold mining complex in the Toguz-Torouzkiy region of Kirgiziya apparently referred to the same complex.

During 1983 at the Kommunarskiy mining directorate of the Yeniseyzoloto association, the gold extraction plant was being renovated and a tailings pond was constructed and put into operation. The complaint was raised that owing to insufficient exploration of deposits, the Kommunarskiy, Saralinskiy, and Artemovskiy mining directorates of the Yeniseyzoloto association were being developed without adequate information, thus limiting the association's ability to plan equipment, ventilation, drainage, worker's housing, etc.[27] As a general measure to increase the volume of Siberian gold exploration, the Ministry of Nonferrous Metallurgy created the special Siberian gold prospecting organization "Sibzolotorazvedka," but this new organization was still not functioning effectively.[28]

Iron Ore.—During the past 30 years, the average iron content of ore decreased from over 50% to between 30% to 35% and was continuing to decrease. Approximately 84% of iron ore was surface mined, and 80% was beneficiated. Iron ore production had been growing much slower than planned. Some problems of the industry were attributed to the failure of the manufacturing industry to provide equipment for concentration plants. The dispersal of the production of this equipment among 35 plants under the management of 8 ministries was said to be hindering needed standardization.[29]

The Krivoy Rog Basin in the Ukraine, the largest iron ore producing area, accounted for about 40% of iron ore extraction and about 60% of the underground mining. Underground mining had reached depths of 700 to 1,000 meters, with concommitant problems of rising costs and depleted reserves. During the past 5 years, the amount of ore extracted underground had decreased.[30] A study was commissioned to compare the economics of deeper high-grade ore extraction with that of intensified mining of the overlaying taconite-type ores that could be concentrated to 68% to 70% iron. Total reserves of iron ore averaging 58% iron down to 2,500 meters were estimated at 273 million tons while reserves of taconite-type ores with an average grade of 25% iron were estimated at about 400 million tons in the 300 to 700 meters stratum.

The Kursk Magnetic Anomaly (KMA), which produced 16% of the country's iron ore, occupied first place in iron ore reserves and second place in iron ore production. At the Lebedi mining and beneficiation complex in the KMA, capacity was increased by 1 million tons per year of iron ore and 870,000 tons per year of concentrate. The pelletizing plant at the Mikhaylovsk complex in the KMA achieved its design capacity of 6.2 million tons per year of iron ore. At the Stoylensk complex, an open pit with a capacity of 4 million tons per year of ore and a concentration plant with a capacity of 1.7 million tons per year of concentrate were put into operation.

There was a shortage of iron ore in the Urals, and 12 million tons of iron ore concentrates was being shipped to the Urals annually from other regions of the country.[31] At the Kachkanar mining and beneficiation complex in the Urals, the 1983 plan called for commissioning 1.5 million tons of iron ore extraction capacity.

At the Kostamush complex in Karelia, which was being built with Finnish assistance, the second stage of the complex was put into operation with capacity for extracting 8 million tons per year of ore to produce 3.25 million tons per year of concentrate and 2.84 million tons per year of pellets; this was the same capacity as the first stage put into operation in 1982, which achieved its design capacity in 1983. A third stage was scheduled to go into operation in 1984.

Iron and Steel.—Despite improved performance in the iron and steel industry, there was still overproduction of certain types of rolled metal and underproduction of high-quality special steels. The U.S.S.R. produced fewer shape sizes than the number produced in leading Western countries.[32] Measuring output only in tons remained an inhibiting factor in producing the needed assortment and quality of steel products. Although during the first 6 months of 1983 the production plan for finished rolled metal was exceeded by 200,000 tons, production fell short for 44 out of the 48 basic product types.[33] To rectify this problem, a standard ton indicator was devised to account for the difference in inputs required to make various products. By 1984, it was intended to switch all enterprises in the iron and steel sector to the standard ton indicator. Nevertheless, this experiment was faltering as higher administrative levels continued to disregard the standard ton indicator in favor of gross output in tons.[34]

In 1984, output of rolled products was planned to increase slightly while low alloy steel output was to increase 18% and coated sheet and tin plate was to increase 13% in comparison with 1983 levels. Of total steel production in 1983, open-hearth production accounted for 57%, oxygen converter steel, 31.6%; electric steel, 11.2%; and Bessemer steel, 0.2%. Continuous casting amounted to 12.4% of steel production. Approximately 50% of steel output was produced from secondary materials. About 65% of secondary materials was used in open-hearth furnaces, 15% in oxygen converter furnaces, and 20% in electric furnaces.

The steel industry was hampered by a shortage of coke, attributed to a decrease in output of suitable coal grades, inefficient utilization of coke in blast furnaces, and an improper use of coke as a fuel in other branches of industry. During 1981-85, it was planned to lower the amount of coke needed to smelt 1 ton of pig iron 33% to 500 kilograms.[35]

A shortage of refractory materials was hampering steel production, and the low quality of refractories was also a problem. Although the Ministry of Ferrous Metallurgy passed a resolution in 1978 to raise the level of monolithic refractory use to 25% of the total, in 1983 the level was only 4.6%. Brick continued to be widely used, but the brick quality was said to be declining. The average duration of furnace roofs had decreased from 9.6 to 6.7 melts, and walls, from 165 to 156 melts. A large amount of material was lost or damaged in transport to metallurgical plants; losses averaged about one-half million tons per year.[36]

Although during the 1981-85 period the Soviets intended to introduce 600 robots into the iron and steel industry for blast furnace, steel converting, and rolling operations, little progress was made in this area. The responsible machine-building ministries and the Ministry of Ferrous Metallurgy were faulted for not engaging in necessary research and for being resistant to technological innovation.[37]

In 1983, the following developments were reported in the iron and steel industry. The Oskol electric-furnace plant near Kursk started up its 2.5-million-ton-per-year iron ore pelletizing plant built by the Federal Republic of Germany's Salzgitter AG, and the plant achieved its full operational capacity. The Oskol plant included direct reduction. Four Midrex modules were being built there by Lurgi, a subsidiary of the Federal Republic of Germany's Metallgesellschaft AG. The first went on-stream in December, and the second was projected to go on-stream in mid-1984. The Oskol complex was planned to eventually have a total of 12 Midrex modules, making it the world's largest direct-reduction-based steelworks. An electric furnace shop, being built by the Federal Republic of Germany's Friedrich Krupp GmbH, was scheduled to be commissioned by 1985. Construction at the Oskol plant was 2 years behind schedule. The delay was attributed to domestic causes rather than foreign suppliers.

At the Vyksa pipe plant, the 250.000-ton-per-year second stage of the shop for producing multilayered pipe for the gas export pipeline was put into operation. Serious delays were reported in bringing capacity on-stream at the Vyksa plant.[38] At the Zhdanov "Il'ich" steel plant, the first stage of a plate-rolling mill was put into operation. The mill, the largest in the U.S.S.R., would supply plates to the Vyksa pipe plant.

At the Orsko-Khalilovo complex, a second 100-ton electric arc furnace with a capacity of 300,000 tons per year and a continuous caster to replace the blooming mills were put into operation. At the Zhdanov "Azovstal'" plant, a new oxygen converter shop with a capacity of 3.5 million tons per year was put into operation.

Other new facilities included a rod and bar mill at the Moscow "Hammer and Sickle" works, a seamless pipe plant at the Dnepropetrovsk "Karl Liebknecht" steelworks, and a powder metallurgy plant in Siberia, built by the United Kingdom's Davy McKee Corp. Ltd., designed to process 60-kilogram batches of powder. First output was reported from the No. 4 coking battery at the Chelyabinsk steelworks.

Lead-Zinc.—The 1983 plan for the extraction of lead-zinc ore was reported fulfilled. During the past 30 years, the average lead and zinc content in ore has decreased by 50%. Between 1965 and 1980, there was a 33% increase in lead consumption while the use of lead in batteries doubled. During the past 10 years, lead scrap collection increased 43%, and zinc scrap, 33%. In 1980, battery lead accounted for 69% of secondary lead production. Owing to a growing scarcity of zinc, it was declared necessary to find suitable zinc substitutes and other ways to economize on zinc usage.[39] Shortage of flotation reagents hampered lead-zinc concentrate production.[40]

Kazakhstan produced over 70% of Soviet lead and 50% of Soviet zinc. The 1981-85 plan for Kazakhstan called for lead production to increase 12% and zinc production to increase 12.7%. The 1983 plan for the extraction and processing of lead and zinc ore in Kazakhstan was reported fulfilled.

The Ust'-Kamenogorsk lead-zinc mining and metallurgical complex in Kazakhstan reported exceeding its production goals for the first 3 years of the 1981-85 5-year plan. An experimental Kivcet CS shop was being installed in 1983 at Ust'-Kamenogorsk. The Kivcet CS flash process, which was developed in the U.S.S.R. in conjunction with the Federal Republic of Germany, combined the functions of sintering, blast furnacing, and slag fuming in one autogenous smelting unit and offered the possibility of recovering along with lead either zinc metal or zinc oxide.

Elsewhere in Kazakhstan, an experimental Kivcet CS smelter was in operation at the Irtysh complex and it was planned to expand production using the same process. At the Leninogorsk complex, a Waelz kiln was put into operation for recovering zinc from slag. Work was reported behind schedule in the construction of the Zhayremsk lead-zinc complex.[41] At the Tekeli lead-zinc complex, production was being hampered by depleted reserves, and exploration was not meeting with success. Renovation of facilities was also needed at Tekeli; it had not been basically modernized since its construction during World War II.[42]

The Madneuli complex in Georgia, which processed copper-lead-zinc ore, as well as barite, reported increasing production 6% during the first 3 years, 1981-83, of the 11th 5-year plan, fulfilling its production goal for the 3-year period. Plans called for a tripling of output at Madneuli by 1990.

In the Urals, the Uchaly complex, which processed copper-zinc ore, reported fulfilling its 1981 and 1982 plan and exceeding its 1983 plan for ore and zinc concentrate production. Work was reported behind schedule in equipping the new Goryevskiy lead-zinc complex in Krasnoyarsk Kray in the Soviet Far East.[43]

Magnesium.—Expansion of capacity was reported at the Ust'-Kamenogorsk complex in Kazakhstan, where titanium and magnesium metals were produced. During the 1971-80 period, production at the Berezniki titanium and magnesium plant in the Urals increased by 50% while the number of workers decreased by 10%. During 1981-82, the Berezniki plant reported fulfilling all major plan targets, and the Zaporozh'ye titanium-magnesium complex reported increased production. The Volgograd bischofite deposit, discovered in 1969, was still awaiting development. It was considered a potentially rich source of magnesium chloride, magnesium metal, magnesium oxide, and bromine.

Manganese.—In 1983, Soviet manganese concentrate production increased by more than 550,000 tons. In the Ukraine, where manganese was produced at the Marganets and Ordzhonikidze complexes in the Nikopol Basin, concentrate production increased 2% to 7.2 million tons. Production at the Chiatura complex in Georgia, however, decreased 3% to 2.6 million tons. Reserves of high-grade manganese ore at Chiatura were decreasing, and in 1983, the U.S.S.R. purchased high-grade concentrates from Gabon and Australia.

In the Nikopol Basin, ore was mined both underground and from open pits. There were 10 open pits in operation; there were the Basanskiy and Gushevskiy pits at the Marganets complex, and the Aleksandrovskiy, Alekseevskiy, Bogdanovskiy, Chkalovskiy No. 1, Chkalovskiy No. 2, Severnyy, Shevchenkovskiy, and Zaporozhnyy pits at the Ordzhonikidze complex. Capacity at open pits such as the Severnyy and Shevchenkovskiy had been raised to between 300,000 and 500,000 tons per year of concentrate from crude ore.

At the Marganets complex, the Eastern (Vostochnyy) sector of Mine No. 9-10 was put into operation in December, and it was planned to extract 50,000 tons by the end of 1983. This sector would increase mine capacity by one-third to 1.5 million tons per year of run-of-mine ore.

Development of the Tavricheskiy complex in the Nikopol Basin had been planned. It would comprise five underground mines, each with a capacity of 1.5 to 2 million tons per year of run-of-mine ore. The first underground mine, with a capacity of 2 million tons per year, was under development.

The U.S.S.R., the world's leading producer of ferromanganese, completed its program for expanding ferromanganese production capacity with the installment of the last of six Japanese-made submerged arc furnaces. Each furnace had a capacity of 120,000 tons per year of ferromanganese. The German Democratic Republic helped finance these furnaces and was to be paid back with part of the output.

Mercury.—The 1983 plan for mercury production was reported fulfilled. The Khaydarkan complex in Kirgiziya, one of the chief mercury producers, reported successfully completing its 1983 production plan and was said to have fulfilled all its obligations for the past 10 years.

Nevertheless, at Khaydarkan the ore body was being depleted, causing a shortage of ore at the complex. However, two new ore bodies were discovered, and development had begun of the new Vostochnyy Mine, which would ensure the future operation of the Khaydarkan complex.[44] New capacity was also reported put into operation at the Aznob (Dzhidzhikrutskiy) complex in Tadzhikistan.

Molybdenum.—The 1983 plan for molybdenum mining was reported fulfilled. Nevertheless, during the past 30 years, the average molybdenum content of ore had decreased 50%. This, combined with insufficient production of flotation reagents, had been causing slowdowns in molybdenum production.[45] It was reported that in 1983 the Soviets were seeking to purchase substantial amounts of molybdenum concentrate.

The fourth and final stage of the Erdenet copper-molybdenum complex in Mongolia was put into operation, and Erdenet was reported producing at its design capacity of 1,000 tons of molybdenum metal in concentrate. The entire output of Erdenet was shipped to the U.S.S.R. for processing. At the Uzbek refractory and heat-resistant materials complex, the second stage of a rolling mill for processing molybdenum alloys for fine molybdenum wire production was put into operation.

Nickel.—The 1983 plan for nickel mining was reported fulfilled. During 1981-85, production of nickel was planned to increase not less than 30%, with much of this increase to come from Noril'sk in East Siberia. The Nadezhda flash smelter at Noril'sk, which was put into operation in 1981, reported reaching its design capacity for smelting 550,000 tons per year of nickel concentrate. In addition, first output was reported from the 1,500-meter-deep Taymyr Mine in the Talnakh region of the Noril'sk complex.

On the Kola Peninsula, the second major nickel mining and production center, the rich ore deposits of the Monchegorsk and Allarechenskiy regions were practically depleted, and the Soviets had been unsuccessful at expanding reserves.[46] Basic reserves and all extraction were situated at the remaining Pechenga Field, which extends up to 35 kilometers in width and 70 kilometers in length. The Pechenga deposits are concentrated at two centers, the western Kaula-Ortoayvi and the eastern Kierdzhipor-Severnoye Onki. The Pechenga Field was considered the most promising area for new reserves.[47]

Expansion of production capacity was underway at the refinery of the Severonikel complex on the Kola Peninsula. A primary crusher was put into operation at Severonikel with a capacity declared to be four times greater than that of existing units.

The U.S.S.R. was assisting in the rapid expansion of Cuba's nickel mining industry and was being paid in exchange with Cuban nickel. An increase in the supply of nickel from Cuba, along with increased domestic production, could free additional Soviet nickel for export to the West.

In October, it was announced that the EEC had rescinded the provisional 7% antidumping duty imposed in June 1983 on Soviet nickel imports, and the antidumping duty collected since June was to be refunded. The Soviets had challenged the EEC duty, which was imposed after a complaint by European nickel producers. The Soviet case was strengthened when it appeared that the Soviet price was being undercut by other producers. The EEC complaint also gave rise to an unresolved controversy during this period as to the proper method for valuing Soviet nickel exports, a large percentage of which, unlike Western exports, was shipped as uncut cathodes.

Platinum-Group Metals.—The U.S.S.R. was one of the world's largest producers and exporters of platinum-group metals. In Soviet platinum-group metals production, the ratio of palladium to platinum was 2.7 to 1. Virtually all platinum-group metals were produced as a byproduct with approximately 75% as a byproduct of Noril'sk nickel-copper production. A major increase in platinum-group metals production was to take place at Noril'sk; electrolytic slimes from Noril'sk were sent for treatment to

Krasnoyarsk, the world's largest platinum-group metals refinery. The Nadezhda flash smelter at Noril'sk, which was put into operation in 1981, reported achieving its design capacity. In addition, first output was reported from the new 1,500-meter-deep Taymyr Mine in the Talnakh area of the Noril'sk complex.

The head of the All-Union gold extraction association, Soyuzzoloto, which administered the production of platinum-group metals, was relieved of his duties for serious shortcomings in his work.[48] In 1983, the Soviet Union changed its contractual arrangements to sell palladium through frame contracts and was able to obtain a higher price for its palladium.

Silver.—Almost all silver was produced as a byproduct of nonferrous operations, including gold treatment plants. Recovery of silver in polymetallic ores averaged 76% at metallurgical plants. However, silver recovery ranged at individual plants from 23% at the Koksuyskaya plant to 89% to 92% at the Belousovskaya, Zyryanovskaya, and Tsentral'naya plants.[49] The Soviets were again reported buying silver in 1983.

Tin.—The 1983 plan for tin mining was reported fulfilled. During the past 30 years, the average tin content of ore had decreased by two-thirds, and tin was one of the few commodities for which the U.S.S.R. was dependent on imports. Work was reported behind schedule in equipping the new Sary-Dzhar tin complex in Kirgiziya and the Deputatskiy tin complex in Yakutia.[50] At the Ryazan tin smelter, where approximately 6% of the tin in the concentrate was being lost in the slag, a new process was introduced for recovering tin from slag.

Titanium.—During 1981-85, the Ust'-Kamenogorsk titanium-magnesium complex in Kazakhstan planned to increase titanium production 27.1%. In 1983, expansion of capacity was reported at Ust'-Kamenogorsk, and a new shop for titanium sponge production was put into operation. At the Berezniki titanium-magnesium plant in the Urals, production increased 50% between 1971 and 1980 while the number of workers decreased by 10%. During the 1981-82 period, the Berezniki plant reported fulfilling all major plan indicators, and during this period, production also increased at the Zaporozh'ye titanium-magnesium complex.

There was a reported shortage of titanium dioxide.[51] The Yagerskoye deposit in the Komi A.S.S.R., one of the country's largest potential sources for pigment titanium, was awaiting development; the complaint was raised that plans for this development were being mismanaged. The deposit was under the jurisdiction of the Ministry of the Petroleum Industry, which, it was stated, was not interested in its development.[52]

There are 4.2 billion tons of explored reserves of apatite-nepheline syenite ore at the Khibiny deposit on the Kola Peninsula, which contain 1% to 2% titaniferous magnetite. During the 1981-85 period, the Apatit Association began experimental processing of this mineral into titanium pigments. Another prospective source of titanium on the Kola Peninsula was the complex apatite-ilmenite-magnetite ore of the Gremyakha-Vyrrmes massif located not far from Murmansk along the railroad line; high-quality ilmenite concentrate had been obtained from this ore.

Tungsten.—During the past 30 years, the average tungsten content of mined ore had decreased 50%. In addition, a shortage of flotation reagents used for removal of accompanying sulfides was causing decreased production.[53] Difficulties were also reported in fulfilling the plan for the production of tungsten wire.[54] In 1983, tungsten concentrate production was reported from the opening of the second stage of the Orlovskiy complex in Chita Oblast' in the Soviet Far East. China was reported to be increasing its supply of tungsten to CMEA countries, decreasing the need for these countries to purchase tungsten in the West.

Minor Metals.—The 1983 plan for rare metal production was reported fulfilled. In Kazakhstan, the Ust'-Kamenogorsk lead-zinc complex reported exceeding its production goals for rare metals for 1981, 1982, and the first half of 1983; byproduct production of indium, thallium, selenium, and tellurium increased. In 1983, the Soviet Union was reportedly seeking to purchase as much as 2 tons of 99.999% gallium in the West. The Soviet Union customarily imported gallium from Czechoslovakia and Hungary.

NONMETALS

Barite.—The Madneuli complex in Georgia, which processed complex ore containing copper, lead, zinc, and barite, reported increasing production 6% during the first 3 years, 1981-83, of the 11th 5-year plan and fulfilling its production goals for this 3-year period. Plans called for tripling output at Madneuli by 1990. The complaint was raised that the barite concentrate used in the oil and gas industries had a number of deficiencies, and it was recommended that a more granular product be produced.[55]

Bentonite.—At the Oglanliskoye deposit in Turkmenistan, which had been in operation for over 50 years, bentonite production increased to 98,000 tons in 1983. By 1990, it was planned to increase bentonite production from this deposit seven times to 700,000 tons per year.

Diamond.—The Yakutia diamond association, Yakutalmaz, reported successfully fulfilling its plan for the first 3 years, 1981-83, of the 11th 5-year plan. In 1983, the new Anabar diamond placer mine in Yakutia was reported put into operation. This placer on the Ebelyakh River was discovered in the mid-1960's, but development was delayed because of its remote location at the Arctic Circle to the north of the Udachnyy pipe.

Fluorspar.—The U.S.S.R. imported over 50% of its fluorspar consumption with the major part coming from Mongolia. Mongolian fluorspar production was administered by the joint Soviet-Mongolian company Mongolsovtsvetmet in which the Soviets had a declared 92% interest. All Mongolian fluorspar was exported to the U.S.S.R. From 1980 to 1982, fluorspar production in Mongolia increased 13%. During 1981-85, the U.S.S.R., in conjunction with other CMEA countries, planned to assist in the development of a new large fluorspar mining and beneficiation complex in the Boro-ondor region of Mongolia.

Graphite.—An area of crystalline graphite was reported discovered by geologists in the central part of the Ukraine on the left bank of the Yuzhnyy Bug River. Reserves were estimated at 100 million tons. The Ukraine accounted for 80% of the country's graphite production.

Nitrogen.—First output was reported from the No. 6 ammonia facility at the Toliatti nitrogen association, raising the capacity of the association to 2.7 million tons per year of ammonia and 900,000 tons per year of urea. At Angarsk in Irkutsk Oblast', a 450,000-ton-per-year ammonia complex reported producing its first output on September 5. A new 330,000-ton-per-year facility for the production of granulated urea was scheduled to go into operation late in the year at the Nitrogen Association in Nevinnomyssk in Stavropol' Kray. A 450,000-ton-per-year ammonia complex was reported to have been put into operation at the Chirchik electrical-chemical production association in Uzbek S.S.R.

Soviet supplies of ammonia to Western Europe were reported reduced in late 1983 owing to difficulties at the Venstpils port in Latvia and the explosion of an ammonia terminal at Yuzhnyy on the Black Sea. Occidental Petroleum Corp. of the United States contracted with the Soviet Union to receive 500,000 tons of Soviet ammonia with an option for a further 200,000 tons. Complaints were raised by U.S. producers that the Soviet Union was exporting large quantities of urea to the United States at prices below U.S. production costs.

Phosphate Rock.—The main centers for phosphate rock production were the Apatit Association on the Kola Peninsula and the phosphorite deposits at Karatau in Kazakhstan. Another source of phosphates on the Kola Peninsula was the Kovdor iron ore complex; an apatite concentration plant processed tailings from the main iron ore beneficiation operations of the complex. Plans for 1983 at Kovdor called for producing 744,000 tons of apatite concentrate, although it was not certain whether output from Kovdor was suitable for fertilizer use.

The largest single phosphate source was the Khibiny deposit on the Kola Peninsula. Mined ore averaging about 15% was upgraded to 39.4% to 39.6% P_2O_5. The Apatit Association extracted almost 50 million tons of ore in 1983, and by 1990, it was planned to extract 60 to 64 million tons per year. The Apatit Association employed approximately 20,000 persons. Delays were reported in achieving capacity at the No. 3 concentration plant at the Apatit Association. The plant was scheduled to produce 1 million tons of concentrate in 1983 and 1.3 million tons in 1984. Also, backups were reported in concentrate shipments because of a lack of freight cars.

At Karatau in Kazakhstan, the other major source of phosphates, there are 46 deposits, only 5 of which were being worked. Four deposits were being surface mined, and at one, the Chulaktauskoye, there was underground mining; in the future, the role of underground mining was planned to increase. At the end of 1983, the Tsentral'naya Mine at the Karatau complex was reported to have been brought to its design capacity of 1.7 million tons per year of ore.

The Chilisay phosphorite basin in Aktyubinsk Oblast', Kazakhstan, was under development and was to be a major center of phosphorite production. Generally low-grade deposits of phosphorites also occur in Verkhnekamsk in the Urals, at Yegor'yevsk and Lopatino in Moscow Oblast', Polpinskoye in Bryansk Oblast', Maardu in Estonia, and in other regions. The Chilisay deposit was planned to be the third largest phosphate producing center in the country. The first stage of the Chilisay complex was planned to go into operation in 1985. Three-fourths of the output of Chilisay would be ground into phosphate flour for direct application.

Following the development of Chilisay, plans called for the development of the Bogdanovskoye deposit in the Aktyubinsk Basin, and production from Bogdanovskoye was also to be used mainly to produce phosphate flour. The criticism was raised by Soviet geologists that two other deposits in the Aktyubinsk Basin, the Pokrovskoye and Algiskoye, would be better suited for the production of phosphate flour while the Bogdanovskoye deposit would be better suited for complex fertilizer production.[56]

In the Baltic Basin, the only two phosphate deposits that were being exploited were the Kingisepp and Maardu. Mining conditions at Kingisepp were reported becoming increasingly more difficult.[57]

There was a deficiency of locally produced phosphate fertilizer in Siberia. There were two explored apatite deposits in Siberia, the Oshurkovo in the Buryat A.S.S.R. and the Beloziminskoye in Irkutsk Oblast'. In addition, exploration was being conducted in the Maymecha-Kotuyskaya region in the north of Krasnoyarsk Kray and in the Altay-Sayansk region of East Siberia. The Zabaykal complex, which was to be constructed at the Oshurkovo deposit, was planned to supply about one-sixth of Siberia's agricultural needs. When the Beloziminskoye deposit was developed, local phosphates would supply approximately 35% of Siberia's needs.

In Vietnam, the U.S.S.R. was assisting in the development of the Lao Cai apatite mine and the second stage of a superphosphate plant.

Potash.—Although potash production declined in 1982, it was reported to have increased more than 15% in 1983. Despite the increase in production, the country experienced shortages owing to transport problems, particularly for deliveries from the Urals potash centers.[58] The 1984 plan called for potash production to increase to 10.2 million tons of K_2O per year.

Potash extraction and processing were centered at enterprises of the Uralkaliy Association in Perm Oblast', at the Byeloruskaliy Association centered in Minsk Oblast', and at the Stebnikov and Kalush plants in the Ukraine. Growth in output was to result from commissioning the Novosolikamsk and Berezniki No. 4 complexes of the Uralkaliy Association and from increasing capacity at the Soligorsk No. 4 complex of the Byeloruskaliy Association.

For the past 5 years, planned goals for Soligorsk No. 4 had not been met. Experimental equipment for dissolution and recrystallization enrichment of potassium salts was still not working although it was declared operational in 1979. One main goal at Byeloruskaliy was to ensure continuous operation of the concentrating plant at Soligorsk No. 4. Other problems cited at the Byeloruskaliy Association were a lack of mining equipment, underground transport vehicles for people and material, cables, electrical equipment, conveyor belts, spare parts, etc. Work at Byeloruskaliy was also hampered by a lack of freight cars to transport output.[59]

Byeloruskaliy's output was a concentrate containing 89% potassium chloride, of which 6.3% was fine grain, 11% fine crystal, 15% granular, and 11% in the form of mixed potassium salts. The Byeloruskaliy Association had installed capacity to produce at least 30% of its fertilizer in granular form. In 1983, it was planned to commission a 50,000-ton-per-year potassium sulfate plant at Byeloruskaliy, using sodium sulfate as a raw material to meet demand for chlorine-free potash.

Mining at Byeloruskaliy was conducted with a three-shaft system, with two shafts for hoisting ore, men, and equipment and a third shaft for ventilation. The shafts were 7 meters in diameter; plans were to increase the diameter of shafts in new mines to 8 to 10 meters, which was considered preferable to increasing the number of shafts as a method for increasing ore throughput. Almost all potash extraction was done by continuous miners using a longwall system.

In 1983 at Uralkaliy, the first stage of the Novosolikamsk Mine came on-stream with a capacity of 900,000 tons per year or 750,000 tons per year of K_2O. Novosolikamsk was originally scheduled to commence production in 1979 with a capacity of 2.9 million tons per year of K_2O. At the Berezniki complex of the Uralkaliy Association, a potassium nitrate plant with an initial capacity of 50,000 tons per year was under construction; capacity was to be expanded to 200,000 tons per year by 1985, but construction was behind schedule. In March 1983, it was reported that Uralkaliy was holding 225,000 tons of fertilizer in warehouses owing to a lack of freight cars.[60]

At the Stebnik complex in the Ukraine, a conveyor system was put into operation to transport the ore directly from the mine to the fertilizer plant. The new system reduced the need to employ rail transport and enabled more than 100 workers to be freed from previous tasks. Also, at the Stebnik complex an accident occurred causing serious environmental damage when concentrated saline brine from a tailings pond broke through an earth-retaining dam, polluting the Dniester River. The water supply from the Dniester River, which supplied several large cities including Odessa and Kishinev, was disrupted. Those responsible for this accident were reportedly put on trial.

At the Karlyuk site of the Gaurdak complex in Turkmenistan, development began on a 700,000-ton-per-year potash solution mine with solar evaporation. However, complaints arose that work was progressing slowly in applying this technology for underground leaching of the sylvanite.[61]

Salt.—A new crushing and sorting plant was put into operation at the Khodzhaikan rock salt complex in Uzbekistan; the capacity of the plant was 1 million tons per year, which would enable the Khodzhaikan complex to triple its output. Reserves at Khodzhaikan are estimated at 1,500 million tons of salt. The Mozyr table salt plant, which was commissioned in 1982, achieved its first-stage design capacity of 180,000 tons per year. Final capacity was planned to be 360,000 tons per year. Mozyr was one of three Soviet table salt producing plants. The other two were the Slavyansk plant in the Donets Basin (Donbas) and the Usol'ye plant in Irkutsk Oblast', Siberia.

Sulfur.—The principal producers of native sulfur were Rozdol and Yavorov (West Ukraine), Gaurdak (Turkmen S.S.R.), and the Volga group of the Kuybyshev sulfur complex. Open pit mining was used to a depth of 100 meters, and the Frasch process, at greater depths. In 1983, the Soviets imported 863,000 tons of sulfur from Poland.

At Yavorov, a new mining section for extracting 250,000 tons per year of sulfur using the Frasch process was put into operation in late 1983. A similar 250,000-ton-per-year section had been put into operation at the end of 1982. At Gaurdak, development began of the South-East open pit. Reserves were said to be adequate for supplying the Gaurdak sulfur complex well into the future and would compensate for other open pits where reserves were almost depleted.

Plans were being made to develop the Tengiz oil and associated gas field in Kazakhstan near the east coast of the Caspian Sea. Tengiz was projected to produce 22 million barrels per year of oil, 71 billion cubic feet per year of sour gas, and 500,000 tons per year of sulfur. The Soviets were taking bids from Western firms to build the desulfurization plant. During the 1981-85 period, production of sulfur from natural gas was planned to increase 25%.

MINERAL FUELS

Coal.—In 1983, coal production declined for the fourth time in the past 5 years. Production was far short of the planned target and still less than the peak production achieved in 1978.

On September 8, Pravda carried an article declaring that coal mines were not meeting their targets, that stockpiling of coal at powerplants was behind schedule, and that deliveries from the Kuznetsk Basin (Kuzbas) were particularly in arrears owing to transport problems. Inadequate performance in the coal industry was blamed in part on the poor work of mining engineers and other technical personnel. This criticism was lodged despite the fact that the coal industry employed about one-half million specialists with diplomas certifying high- and mid-level education. Research institutes were criticized for not addressing the practical problems of the industry.[62]

Problems in introducing new technology, along with faulty planning, had hindered production. For example, the Dolzhanskaya Kapital'naya Mine in Voroshilovgrad Oblast' was planned to have labor productivity 10 times higher than underground mines in the Ukraine. The mine was planned to produce 14,000 tons of coal per day and to employ 858 workers. Technology developed for this mine was to serve as a model for the industry. However, the mine took 10 years to develop, and the intended equipment was obsolete by the time the mine was in operation. The specialized equipment that was designed specifically for the mine either was not produced or failed to meet design standards.[63] Other failures also occurred. The mine finally employed several thousand workers instead of the original 800 and was being operated as an ordinary mine but with even greater problems. Many of the original features of the mine that called for advanced equipment were still present but were ill suited for the equipment that was in use.[64]

During the past decade, the average depth of Soviet underground coal mining had increased by 100 meters, averaging 470 meters nationally and 620 meters in the

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Donbas. A Soviet evaluation of equipment used in underground coal mining concluded that 16.4% of the equipment was outdated and should be removed from production, 23.2% needed modernization, and 60.3% was state of the art.[65] Despite the fact that increases in production were planned to come from Siberian fields, five of the six new plants planned to produce coal mining machinery were to be built in the European part of the country in the Donbas region.

There were 163 coal beneficiation plants operating in 1983. Coal quality had been decreasing; during the 1976-80 period, the calorific value of coal used at electric powerplants decreased 6.4% while coal deliveries remained at the same level.[66] Complaints were raised that coal from the Ekibastuz Basin in Kazakhstan delivered to power stations had an ash content over 50%.[67]

Soviet-explored coal reserves in 1980 in categories $A+B+C_1$[68] were 285 billion tons, of which 174 billion tons was hard coal and 111 billion tons was lignite. There was an additional 49 billion tons of lignite in category C_2. Lignite from open pit mines was to play an increasing role in fueling powerplants. Of the total lignite reserves suitable for open pit mining, 98% is in the eastern part of the country. The largest reserves are in the Kansk-Achinsk Field in East Siberia with reserves estimated at 75 billion tons.

Despite Siberia's vast quantities of low-quality reserves, railroad facilities were inadequate for shipping this coal to the western part of the country. Proposed solutions for utilizing this coal included constructing large thermal powerplants near the deposits connected to long-distance electricity networks, constructing long-distance coal slurry pipelines, and transforming the coal into liquid fuels. It was not certain which project or combination of projects would be undertaken as the decision rested on a number of factors including cost, technological feasibility, and access to Western technology, equipment, and credits.

Owing to falling production in the Donbas, the country's largest coal producing region, it was recommended that priority be given to developing the Kuzbas. In the Donbas, it was necessary to exploit deeper, thinner seams. Production in the Donbas had fallen from a high of 223 to 200 million tons per year, and it would require a huge investment to check the downward slide. With declining production in the Donbas, the mines were put on virtually a 7-day work schedule. Although only 9 Sundays were worked in 1970 and 13 in 1975, work was conducted on 43 Sundays in 1983. Sunday work was criticized as being responsible for problems with repair and maintenance and labor discipline and efficiency.[69]

The Kuzbas, the second largest production region, was producing about 150 million tons per year, but it was stated that it might be possible to double this amount. The high-quality coal from the Kuzbas was a suitable substitute for Donbas coal, while the large Siberian lignite reserves were not suitable owing to their low calorific value. There were 25 coal beneficiation plants in the Kuzbas that processed about 45% of the coal extracted, including all of the coking coal. The Raspadskaya beneficiation plant was commissioned in 1983.

In the past 20 years, no new mines were developed in the Kuzbas, and renovation plans had continually fallen short of their target. Mine renovation in the Kuzbas averaged 16 to 17 years per mine, and one mine, the Krasnyy Uglekop, had been undergoing renovation since 1959.[70] The majority of capital investment in the coal mining industry was still directed to the Donbas. Labor productivity in the Kuzbas was said to be much higher than in the Donbas. One-third of the coal production in the Kuzbas was from open pits, and increases in production were planned through development of open pit production.

It was planned to increase coal production in Kazakhstan to 134 million tons per year with practically the entire increase in production to come from the Vostochnyy open pit in the Ekibastuz Basin, which had a capacity of 30 million tons per year. Development of this open pit, however, was lagging,[71] and the 1983 plan for production from Ekibastuz was not being met.[72] The Bogatyr open pit in the Ekibastuz Basin had achieved capacity output of 50 million tons per year. It was the largest coal producing open pit in the U.S.S.R.

Experimental work was underway to transform lignite from the Kansk-Achinsk Basin into liquid fuel. Work was reported behind schedule on the construction of the experimental coal liquefaction plant that was scheduled to begin operation in 1983.[73] In addition, construction was occurring of thermal electric powerplants in the Kansk-Achinsk Basin near the deposits to make use of this coal. To move coal from the open pits to the Berezovskaya I powerplant at Kansk-Achinsk, a 15-kilometer conveyor belt system was being constructed. Also, in 1984 it was planned to put into operation an experimental coal liquefaction plant for lignite mined at the Bel'kovskiy Mine in Tula Oblast' in the Central European part of the country.

The Neryungri coking coal complex in southern Yakutia was being developed jointly by the U.S.S.R. and Japan. Japan originally was to import over 3 million tons per year of coking coal from Neryungri starting in 1983, but the Soviets were not able to ship this amount. In 1983, the price of coking coal sent to Japan was reduced 18% in line with world prices.

Table 10.—U.S.S.R.: Estimated primary energy balance in 1983

(Million tons of standard coal equivalent)

	Production	Imports	Exports	Apparent consumption
Coal (lignite, anthracite, bituminous, coke)	478	9	30	457
Crude oil and petroleum products	905	26	263	668
Natural and associated gas	634	5	73	566
Peat	8	--	--	8
Oil shale	11	--	--	11
Hydropower	22	--	2	20
Nuclear power	14	--	--	14
Fuelwood	23	--	--	23
Total	2,095	40	368	1,767

Natural Gas.—In 1983, natural gas production continued to increase at a rapid rate based on development of the Urengoi Field in West Siberia. The center of gas production had shifted dramatically to Siberia. Although 40% of the natural gas in 1975 was extracted from deposits in the western part of the country in the Ukraine, North Caucasus, and Komi A.S.S.R., in 1980 it was 19%, and by 1985, it was planned to be 10%.

By the end of 1983, three of the five major domestic gas pipelines planned during 1981-85 for transporting gas from the Urengoi Field in West Siberia were in operation. These were the Urengoi-Ukhta-Gryazovets-Moscow, the Urengoi-Petrovsk, and the Urengoi-Novopskov pipelines, with the last put into operation in 1983. In addition, construction of the line portion of the Urengoi-Uzhgorod gas export pipeline was completed, and the Soviets reported that the first gas shipments through the export pipeline began several weeks ahead of schedule at the end of 1983. Work had not been completed on the compressor stations for the line. All of the pipelines were being built with 1,420-millimeter pipes, and gas traveled through the pipe under a pressure of 75 atmospheres.

Speculation arose in the Western press in late 1983 that a fire and explosion had caused serious damage to the trans-Siberian gas export pipeline and would delay the opening of the pipeline by 1 year to 1985. However, the Soviet Minister of the Gas Industry replied that these were false rumors. He stated that there had been a fire at one of the smallest and least important compressor stations, but no explosion, and that the damaged equipment would soon be replaced.

The U.S.S.R.'s largest Central Asian gasfield, the Dauletabad Field in the Karakum Desert of southeast Turkmenistan, was put on-stream. The gas was piped into the network supplying Leningrad, Moscow, and other large European population and industrial centers. Production from the first stage was to be 177 billion cubic feet per year and was to reach 777 billion cubic feet per year by 1985. Turkmenistan was second only to West Siberia in gas production. In 1980, total production in Turkmenistan was 2.2 trillion cubic feet and was targeted to reach 2.9 trillion cubic feet in 1985, equaling 13% of the U.S.S.R.'s total output. Turkmenistan's second largest Shatlyk Field was declining in production.

Production at the Yamburg Field north of Urengoi in West Siberia, the country's second largest after Urengoi, was scheduled to begin in 1986. Yamburg was expected to provide much of the increase in gas production during 1986-90. Maximum production at Yamburg was projected at about 7 trillion cubic feet per year in comparison with a projected maximum at Urengoi of 8.8 trillion cubic feet per year. Plans for Yamburg called for the construction of at least three long-distance pipelines. The gas would be cooled to permafrost temperature before transmission to protect the tundra and to increase pipeline throughput. Also, development of the railroad and river infrastructure was needed to supply Yamburg.

At the Astrakhan sour gas deposit, which was under development, construction of a gas treatment facility to recover the sulfur was planned; the gas contains up to 25% hydrogen sulfide. The Soviets were purchasing Western equipment and technology for treating this gas.

Plans were being made to develop the Tengiz oil and associated gas field in Kazakhstan near the east coast of the Caspian Sea. Tengiz was projected to produce 22 million barrels per year of oil, 71 billion cubic feet per year of sour gas, and 500,000 tons per year of sulfur. The Soviets were taking bids from Western firms to build a desulfurization plant at Tengiz; the startup of the field was planned for 1988.

The U.S.S.R. and Poland signed an agreement for Polish workers to help construct compressor stations, lay gas pipelines, and erect associated housing and services in return for Soviet gas. The Soviet Union and Czechoslovakia agreed to construct a fourth pipeline across Czechoslovakia to supply additional Soviet gas to West European consumers.

The U.S.S.R. and Austria signed a protocol to their previous agreement about delivery of gas through the trans-Siberian pipeline concerning the quantity of shipments of Soviet natural gas.

For 1984, the Soviet Union executed orders for the purchase of 1 million tons of large-diameter pipe from Japan, 800,000 tons from Italy, 350,000 tons from the Federal Republic of Germany, and 250,000 tons from France. Talks with firms were continuing about additional sales.

Nuclear Power.—The Soviet nuclear development programs suffered a setback when an accident occurred at the Atommash plant in Vologdonsk, which built reactors and nuclear powerplant equipment. The Atommash plant started production in 1981 and was to play a key role in nuclear power development. Work on completion of the plant was considerably delayed. Possibly prompted by this accident, it was announced that a State Committee for Safety in the Nuclear Power Industry was established.

Petroleum.—Petroleum production continued to slowly increase. The Soviets maintained their high level of oil exports to the West, and there was no decrease in exports to the CMEA. The Soviets were able to maintain their level of oil exports, in part, by reexporting Middle Eastern and North African oil received in exchange for armaments and other assistance.

Expenditures per ton of oil recovered more than doubled in the past decade and would continue to increase.[74] In West Siberia, where almost 60% of Soviet oil production was concentrated, it was planned to put seven to eight new fields per year into production. The cost of energy and labor for developing West Siberian fields was increasing, and problems existed in supplying high-quality equipment, including drill pipe, pipeline pipe, drilling rigs, and bits. In 1983, for the first time, oil production goals for West Siberia were not met.[75]

Oil reserves were not increasing at the rate planned.[76] A major problem facing the oil industry was increasing the rate of recovery from wells; approximately 60% to 70% of the oil reserves remained in fields considered depleted.[77] Approximately 80% of oil in the U.S.S.R. was recovered by water flooding, which was used practically from the moment of development.

In 1983, the 1,642-kilometer Chimkent oil pipeline was completed; the line went from Surgut in West Siberia through Omsk and Pavlodar to Chimkent in Kazakhstan. The completion of the pipeline was said to be of great importance for reducing the load on the railroads[78] and would also facilitate development of the Chimkent petrochemical complex consisting of a refinery and rubber tire plant.

Plans for 1984 called for oil and gas condensate production to increase to 4.6 billion barrels, with 4.4 billion barrels of this amount being produced by the Ministry of the Petroleum Industry. Increased petroleum production was planned from West Siberia, the Komi A.S.S.R., and western Kazakhstan.

A mobile rig for work in the Caspian Sea was commissioned. During the first 10 months of 1983, the Caspian rigs drilled less than 40% of their assigned footage. Approximately 70% of oil production in Azerbaidzhan was from offshore production in the Caspian Sea. Development of the 28th of April Field in the Caspian Sea was underway. Eight wells were being worked from two platforms at this field, five of which were put into operation in 1983.

Plans called for the startup of commercial production of condensate in 1984 from the Urengoi gas-condensate field, with output the first year projected at 15 million barrels and the second year at 30 million barrels. Urengoi, it was claimed, has massive condensate reserves. After initial treatment, the condensate would be sent to a newly built fractionation unit at Surgut through a

350-mile condensate line, yet to be built.

Plans called for developing the Tengiz oil and associated gas field in Kazakhstan near the east coast of the Caspian Sea. Tengiz was projected to produce 22 million barrels per year of oil, 71 billion cubic feet per year of sour gas, and 500,000 tons per year of sulfur. The startup of the project was planned for 1988.

The U.S.S.R. and Norway signed an agreement for oil development in the Barents Sea. The countries had a longstanding unresolved border dispute over 60,000 square miles of the Arctic Continental Shelf in the Barents Sea claimed by both countries as part of their 200-mile economic zone; the area has a high probability of oil and gas reserves. Discussions held during 1983 did not resolve the dispute, and the Soviets, in what was viewed as an attempt to pressure for a settlement, moved a drilling ship to the edge of the disputed waters.

Oil Shale.—In 1983, national oil shale production decreased 6% to 33 million tons. Approximately 97% of the country's oil shale production came from the Baltic oil shale field. Oil shale reserves are located in the northwest regions of the country, and in the Volga region, Siberia, and Kazakhstan. Reserves in categories $A+B+C_1$ total 6.7 billion tons with an additional 5.7 billion tons in category C_2. The majority of reserves are in the Baltic shale-bearing field with 5.1 billion tons in categories $A+B+C_1$. This area includes the Estonian, Leningrad, and Tapa deposits, the first two of which were being exploited. The Estonian deposit contains 80% of the country's reserves and produced over 80% of Soviet oil shale.

In Estonia, the shale was being produced from seven underground mines and four open pits. The largest enterprises were the Estonia Mine and the October open pit, with respective production of 5 million tons and 4 million tons per year. Two electric powerplants, the Baltic and the Estonian, with a total capacity of over 3 million watts, worked on the basis of this oil shale. Ash from the combustion of oil shale was being used for the production of portland cement, concrete, and silica bricks as well as in agriculture to neutralize acid soils. Oil shale was processed at two plants in the city of Kohtla Jarve in Estonia. The main products were shale tar, natural gasoline, water-soluble phenols, solvents, antierosive agents for soil, etc.

The Volga shale field contains 0.7 billion tons of reserves in categories $A+B+C_1$ located in the Kashpir, Dergunov, and Ulyanov deposits. At the Volga Field, however, less than 1 million tons per year was being mined by the single Kashpir Mine, which supplied the Syzran thermal electric powerplant. The Volga shales differ from the Baltic shales by their higher ash and sulfur content. Burning shales from the Volga Field in the Syzran powerplant were said to have an undesirable environmental impact that was inhibiting their wider use. A recommendation was made for greater use of Volga Field shales as fuel for thermal electric powerplants and for simultaneously developing the technology for eliminating the pollution.

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[1] This publication is based on a review of sources published in the U.S.S.R.

[2] Foreign mineral specialist, Division of Foreign Data.

[3] Voprosy ekonomiki (Problems in Economics), Moscow. No. 12, Dec. 1983, pp. 42-50.

[4] Izvestiya Akademii Nauk S.S.S.R., Seriya Geologicheskaya (Reports of the U.S.S.R. Academy of Sciences, Geological Series), Moscow. No. 5, 1983, p. 33.

[5] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 38, Sept. 1983, p. 2.

[6] Planovoye khozyaystvo (Planned Economy), Moscow. No. 9, Sept. 1983, p. 43.

[7] Pravda (Moscow). Mar. 19, 1984, p. 1.

[8] Tsvetnye metally (Nonferrous Metals), Moscow. No. 1, Jan. 1984, pp. 1-5.

[9] Sotsialisticheskaya industriya (Socialist Industry). Moscow, Feb. 1, 1984, p. 2.

[10] Tsvetnye metally (Nonferrous Metals), Moscow. No. 8, Aug. 1983, p. 1.

[11] ———. No. 9, Sept. 1983, pp. 1-4.

[12] Zarya vostoka (Dawn of the East), Tbilisi. Feb. 24, 1984, p. 1.

[13] Council for Mutual Economic Assistance (CMEA) was founded in Jan. 1949. The founding members were Bulgaria, Czechoslovakia, Hungary, Poland, Romania, and the U.S.S.R. Albania joined in Feb. 1949 but ceased to take part in meetings in 1961. The German Democratic Republic was admitted in 1950, Mongolia in 1961, Cuba in 1972, and Vietnam in 1978. Yugoslavia obtained permanent observer status in 1965.

[14] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Dec. 14, 1983, p. 1.

[15] Kommunist Tadzhikistana (Communist of Tadzhikstan), Dushanbe. Jan. 1, 1984, p. 1.

[16] Work cited in footnote 10.

[17] Kazakhstanskaya pravda (Kazakhstan Truth), Alma-Ata. Sept. 10, 1983, p. 2.

[18] Tsvetnye metally (Nonferrous Metals), Moscow. No. 9, Sept. 1983, pp. 5-9.

[19] ———. No. 4, Apr. 1984, p. 1.

[20] Material'no-tekhnickeskoye snabzheniye (Material-Technical Supply), Moscow. No. 6, June 1983, p. 15.

[21] Kazakhstanskaya pravda (Kazakhstan Truth), Alma-Ata. Dec. 13, 1983, p. 1.

[22] Pravda (Moscow). Oct. 5, 1983, p. 1.

[23] Razvedka i okhrana nedr (Exploration and Conservation of Mineral Resources), Moscow. No. 3, Mar. 1984, pp. 2-8.

[24] Pravda Vostoka (Eastern Truth), Tashkent. Mar. 7, 1984, p. 1.

[25] Sobraniye postanovleniy Pravitel'stva Soyuza Sovetskikh Sotsialisticheskikh Respublick (Collection of Decrees of the Government of the Union of Soviet Socialist Republics), Moscow. No. 20, July 1, 1983.

[26] Tsvetnye metally (Nonferrous Metals), Moscow. No. 2, Feb. 1983, pp. 82, 83.

[27] Bezopasnost' truda v promyshlennosti (Labor Safety in Industry), Moscow. No. 3, Mar. 1984, pp. 2-4.

[28] Work cited in footnote 26.

[29] Pravda (Moscow). Apr. 19, 1983, p. 2.

[30] Gornyy zhurnal (Mining Journal), Moscow. No. 8, Aug. 1983, p. 41.

[31] Sovetskaya Rossiya (Soviet Russia), Moscow. Jan. 6, 1984, p. 2.

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[32] Planovoye khozyaystvo (Planned Economy), Moscow. No. 7, July 1983, pp. 26-37.

[33] Pravda (Moscow). Oct. 29, 1983, p. 2.

[34] Work cited in footnote 32.

[35] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Oct. 21, 1983, p. 2.

[36] Trud (Labor), Moscow. Aug. 2, 1983, p. 2.

[37] Work cited in footnote 9.

[38] Page 4 of work cited in footnote 5.

[39] Stal' (Steel), Moscow. No. 6, June 1983, p. 6.

[40] Work cited in footnote 5.

[41] Work cited in footnote 18.

[42] Kazakhstanskaya pravda (Kazakhstan Truth), Alma-Ata. Mar. 8, 1984, p. 2.

[43] Work cited in footnote 18.

[44] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Oct. 18, 1983, p. 1.

[45] Work cited in footnote 5.

[46] Work cited in footnote 23.

[47] Page 3 of work cited in footnote 4.

[48] Work cited in footnote 25.

[49] Work cited in footnote 26.

[50] Work cited in footnote 18.

[51] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 42, Oct. 1983, p. 2.

[52] Work cited in footnote 51.

[53] Work cited in footnote 5.

[54] Work cited in footnote 20.

[55] Tsvetnye metally (Nonferrous Metals), Moscow. No. 4, Apr. 1984, p. 87.

[56] Sotsialisticheskaya industriya (Socialist Industry), Moscow. June 21, 1983, p. 2.

[57] Gornyy zhurnal (Mining Journal), Moscow. No. 11, Nov. 1983, pp. 32-37.

[58] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 5, Jan. 1984, p. 2.

[59] Promyshlennost' Byelorussii (Byelorussian Industry), Minsk. No. 6, June 1983, pp. 3-37.

[60] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Mar. 16, 1983, p. 3.

[61] Work cited in footnote 51.

[62] Sotsialisticheskaya industriya (Socialist Industry), Moscow. May 12, 1983, p. 2.

[63] Pravda (Moscow). Sept. 30, 1983, p. 3.

[64] Work cited in footnote 62.

[65] Work cited in footnote 5.

[66] Elektricheskiye stantsii (Electric Powerplants), Moscow. No. 9, Sept. 1983, pp. 2-4.

[67] Work cited in footnote 66.

[68] $A+B+C_1$ reserves are called explored reserves and would be considered within the context of the Soviet economy similar to economic reserves. The C_2 reserves are of lesser reliability and are not used as a basis for mineral development and would be considered within the context of the Soviet economy similar to uneconomic reserves.

[69] Pravda (Moscow). Mar. 23, 1984, p. 2.

[70] Sovetskaya Rossiya (Soviet Russia), Moscow. Jan. 21, 1984, p. 2.

[71] Pravda (Moscow). Sept. 20, 1983, p. 1.

[72] ———. Oct. 14, 1983, p. 1.

[73] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 15, Apr. 1983, p. 2.

[74] Ekonomicheskoye sotrudnichestvo stran-chlenov SEV (Journal of Economic Cooperation of the Member Countries of CMEA), Moscow. No. 8, Aug. 1983, pp. 34-37.

[75] Izvestiya (Moscow). Mar. 24, 1984, p. 3.

[76] Razvedka i okhrana nedr (Exploration and Conservation of Mineral Resources), Moscow. No. 9, Sept. 1983, p. 2.

[77] Pages 33 and 34 of work cited in footnote 4.

[78] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Mar. 17, 1983, p. 1.

The Mineral Industry of the United Arab Emirates

By John R. Lewis[1]

Expansion of its crude oil reserves and tremendous nonassociated natural gas deposits, both onshore and offshore, continued unabated in the United Arab Emirates in 1983. There were indications, however, that the pace of drilling activity was slackening at yearend and that emphasis was turning more and more toward well workovers. Construction of ancillary facilities, such as offshore platforms for petroleum production, storage, repressuring, and living quarters, was moving ahead in several places. Onshore oil- and gas-related construction was also very busy. Dubai's aluminum plant operated at well above rated capacity, and construction of new cement plants begun in previous years was progressing. The fertilizer plant of the Abu Dhabi National Oil Co. (ADNOC) at Ruwais went on-stream in November.

PRODUCTION AND TRADE

Crude petroleum production and export continued to dominate the economy of the United Arab Emirates. Exports and reexports of all nonpetroleum items amounted to roughly one-seventh of the value of petroleum exports. Crude oil production was down 10% from that of 1982, owing to reduced consumption of energy among the United Arab Emirates' major customers, primarily Japan, the European Economic Community, and the United States. In addition, because of lower prices agreed upon by Organization of Petroleum Exporting Countries (OPEC) members, the income from oil sales by the United Arab Emirates dropped 28% during the first half of 1983. The peak crude oil producing year for the United Arab Emirates was 1977, when annual production topped 735 million barrels. Reduced demand in each succeeding year thereafter had brought the Emirian annual production to about 409 million barrels in 1983.

Proved crude reserves sufficient to last more than 70 years at 1983 producing rates and a sustainable production rate five times that of 1983 gave the United Arab Emirates a strong economic base. Despite a temporary world oversupply and reduced demand for petroleum, the United Arab Emirates was proceeding energetically to develop hydrocarbon reserves in order to have them ready when required. Several oil reservoirs were capped. Development of nonassociated natural gas was particularly active as withdrawals from associated oil-gas reservoirs were reduced even as demand for gas to fill liquefied natural gas (LNG) commitments remained strong.

Three Emirates, Abu Dhabi, Dubai, and Sharjah, commercially produced petroleum, and production from the recently discovered Saleh Field off Ras al-Khaimah would be joining the export flow early in 1984. It appeared possible that Ajman, with a promising wildcat well, would not be far behind.

Table 1.—United Arab Emirates:[1] Production of mineral commodities[2]

Commodity[3]	1979	1980	1981	1982[p]	1983[e]
ABU DHABI					
Cement, hydraulic[e] thousand metric tons	200	500	700	780	[4]800
Gas, natural:					
Gross production million cubic feet	483,809	508,445	472,508	410,000	NA
Marketed production do	40,100	115,500	320,126	300,000	NA
Natural gas liquids thousand 42-gallon barrels	15,000	32,200	[e]35,000	38,000	NA
Petroleum:					
Crude do	533,995	492,154	413,910	[4]319,400	[4]283,000
Refinery products:					
Gasoline do	[e]1,500	1,500	[e]6,000	13,000	20,000
Kerosine do	[e]400	400	[e]1,000	6,000	10,000
Distillate fuel oil do	[e]1,600	1,600	[e]6,500	10,000	25,000
Residual fuel oil do	[e]1,400	1,400	[e]5,600	7,000	10,000
Naphtha do	[e]100	100	[e]1,000	5,000	10,000
Refinery fuel and losses do	[e]500	500	[e]500	2,000	5,000
Total do	[e]5,500	5,500	[e]20,600	43,000	80,000
Sulfur: Byproduct from petroleum refining metric tons	--	--	[e]5,000	10,000	15,000
DUBAI					
Aluminum, primary ingot do	--	25,000	[e]106,000	148,739	[4]151,170
Cement, hydraulic thousand metric tons	400	500	[e]500	[4]350	[4]800
Gas, natural:[e]					
Gross production million cubic feet	144,000	142,000	146,000	140,000	150,000
Marketed production do	23,400	23,800	38,000	70,000	120,000
Natural gas liquids:					
Propane thousand 42-gallon barrels	--	1,500	[e]2,500	5,000	10,000
Butane do	--	1,000	[e]1,100	3,000	8,000
Natural gasoline do	--	1,000	[e]1,700	4,000	9,000
Petroleum, crude do	129,316	127,818	130,889	[4]133,850	[4]121,830
FUJARAH					
Cement, hydraulic thousand metric tons	--	--	--	--	[4]520
RAS AL-KHAIMAH					
Cement, hydraulic do	450	500	[e]800	[4]750	[4]1,200
SHARJAH					
Cement, hydraulic[e] do	220	220	220	[4]188	[4]685
Gas, natural:					
Gross production[e] million cubic feet	8,700	6,600	20,000	30,000	40,000
Condensate thousand 42-gallon barrels	--	--	--	4,500	6,000
Petroleum, crude do	4,697	3,586	3,540	[4]2,555	[4]3,932

[e] Estimated. [p] Preliminary. NA Not available.

[1] In addition to the Emirates listed, Ajman and Umm al-Quawain record no mineral production but presumably produce small quantities of crude construction materials.

[2] Table includes data available through July 27, 1984.

[3] In addition to the commodities listed, crude construction materials such as common clays, sand and gravel, and stone presumably are produced, but output is not recorded quantitatively, and general information is inadequate to make reliable estimates of output levels.

[4] Reported figure.

COMMODITY REVIEW

METALS

The relatively new aluminum smelter at Jebel Ali, Dubai, which is operated by the Dubai Aluminium Co. Ltd. (DUBAL), continued producing metal at levels above rated capacity during 1983. When the plant was inaugurated late in 1979, company announcements placed full output at 135,000 tons of aluminum per year. However, according to DUBAL's annual report for 1983, more than 151,000 tons of metal was produced during the year, about 16% above rated capacity. Japan remained DUBAL's best customer, buying 48% of the plant's output of extrusion billet, standard ingot, tee ingot, and secondary aluminum sow. Other markets were Iran, the Republic of Korea, the United Arab Emirates, and the United States. Sales to the United States amounted to 16,000 tons, about 11% of DUBAL's total production. The smelter used natural gas to fuel its electrical generating facilities, and employed the prebaked method to win its metal. Alumina feedstocks were imported from Australia.

NONMETALS

Cement.—Construction of a 300,000-ton-per-year white cement plant, the first such large plant in the Persian Gulf States, moved forward during the year. Construction of the integrated plant, to be located in the Khor Khwair District of Ras al-Khaimah, was arranged between the Ras al-Khaimah Co. for White Cement and Construction Materials and the Japanese firm, Hitachi Zosen Engineering and Construction Co. Ltd., assisted by expertise from Japan's Onoda Cement Co. Ltd. and the Onoda Engineering & Consulting Co. Ltd. It was anticipated by the United Arab Emirates that Ras al-Khaimah and nearby Persian Gulf States would consume the plant's entire output.

The 500,000-ton-per-year clinker grinding plant of the Ajman Cement Co. at Hamidiyyah was nearing completion and scheduled for startup during 1984.

Reflecting the pace of many types of construction throughout the Persian Gulf States, average per capita consumption of cement in 1982 in the Emirates was reported to be 3.9 tons.[2] Consumption in the United States was about 325 pounds per person during the same year.

Stone.—Limestone for the northern Emirates was to be used in a joint venture plant to make calcium carbide, which was to be built in Dubai. The $2.2 million plant was contracted for in October 1983 by a Dubai firm, Issa Omar ibn Haydar General Trading Establishment, with a Yugoslav firm, SZP Zavarivac, which was involved in the welding industry. Operation was expected to begin during the summer of 1984. The products were to be consumed in the Emirates, and excesses would be exported.

MINERAL FUELS

Natural Gas.—ADNOC was proceeding with its plan to develop the 14,000- to 15,000-foot-deep Khuff Zone at Abu Dhabi's offshore Umm Shaif Field. Drilling was begun in the spring of 1983, and all necessary wells were scheduled for completion by yearend. The Khuff Formation lies beneath a shallower oil zone and will produce nonassociated gas. Initial production was to be at a rate of about 250 million cubic feet of gas per day. The gas was to be channeled to the LNG plant of the Abu Dhabi Gas Co. (ADGAS) on nearby Das Island to augment the shortfall in gas supplies to the plant from offshore associated gas reservoirs created when there was reduced demand for crude oil. Any gas not needed at the ADGAS plant was to be injected into the gas cap of the Umm Shaif oil reservoir, which had been overproduced to cover gas requirements at ADGAS. Oil production rates in both the Upper and Lower Zakum Reservoirs were also increased in order to augment associated gas supplies to the Das Island LNG plant.

ADGAS owned and operated the Das Island LNG plant, where it produced LNG and liquefied petroleum gas (LPG). The entire output was sold, under a long-term contract, to Tokyo Electric Co. of Japan. The plant's annual capacity was 17.5 million barrels of LNG and 9.2 million barrels of LPG, plus some pentane. The ADGAS storage facilities at Das Island were to be increased during the year. Funding came from a $500 million loan from the National Bank of Abu Dhabi at the head of a consortium of Arabian, Japanese, and United States banks. Completion of the project was slated for 1985.

The onshore gas reservoir, Thamama C in the Habshan District, was being developed by ADNOC in a $379 million project that would ensure sufficient gas for the Abu Dhabi Water and Electricity Department and for the Ruwais industrial zone and its petrochemical and other operations. A gas-gathering system and a processing plant were being designed to handle 450 million cubic feet per day of sour wet gas collected from 19 wells being drilled to about 9,185 feet in the Thamama C Formation. The project's daily output design was 375 million cubic feet of sweet gas, 4,500 barrels of gas liquids, 26,000 barrels of condensate, and 800 tons of granular sulfur. Trial operations lasting 3 months were scheduled for early 1984.

Another massive expansion project was undertaken during 1983 by the Dubai Natural Gas Co. (DUGAS) at a cost of about $100 million. Involved was the drilling of a number of offshore gas wells, a gathering system terminating at Jabal 'Ali, and new onshore facilities. The expansion was necessary in order to meet demand for gas, LPG, and condensate. Prior to the expansion, DUGAS was operating at 98% of capacity.

In Sharjah, production from the onshore Sajaa gas and gas condensate field operated by Amoco Sharjah Oil Co., a subsidiary of Standard Oil Co. (Indiana), averaged 31,300 barrels per day, an increase of more than 6,000 barrels over daily production rates toward the end of 1982. Yearend 1983 production from the Sajaa Field was running at 40,000 barrels per day. Natural gas deliveries began during the year to the Emirates General Petroleum Corp. under a 20-year contract for 1.5 trillion cubic feet of gas to be furnished to utilities and industry in the area. Further drilling and development, begun in 1983 by Amoco, was to increase production to about 55,000 barrels of liquids per day and boost the gas output to 500 million cubic feet per day. Amoco was also proceeding with its three-dimensional seismic evaluation of its 590,000-acre concession to define further drillable prospects.

The Sajaa gas discovery sparked exploration in neighboring Dubai, and in May 1982, ARCO-Dubai, a subsidiary of Atlantic Richfield Co., discovered gas and condensate from a heavily overthrust section of the Lower Cretaceous Thamama Formation. British National Oil Corp. held a one-third interest in the concession. The discovery well, Margham No. 1, tested at 2,330 barrels of 50° API condensate and 34.4 million cubic feet of gas per day. By mid-1983, three more wells had been drilled and two were preparing to spud. ARCO-Dubai planned to develop the fields with a total of 25 wells. The Fluor Corp. of the United States received a $200 million contract for construction of the first phase of an oil- and gas-processing plant at Margham during the year.

Petrochemicals.—Continued curtailment of the production of crude oil and associated natural gas, in accordance with OPEC production quotas, was forcing a slowdown in Abu Dhabi's expansion plans for extensive petrochemical facilities at the Ruwais complex. In addition to a reduction in annual export earnings between 1979 and 1983 of about 43%, the curtailed crude production rate was creating acute shortages in associated natural gas for use at many existing facilities including petrochemical plants. Nevertheless, the new plant of the Ruwais Fertilizer Industries Co. Ltd. (FERTIL) at Ruwais was completed in November 1983. Startup was dependent upon completion of the Thamama C offshore nonassociated gas project, because onshore associated gas was too scarce.

FERTIL was a joint venture with 67% of the participation held by ADNOC and 33% by Compagnie Française des Pètroles of France. Cumulative construction costs were up to $374 million by completion, well above the $200 million originally estimated. Daily output was to be 1,000 tons of ammonia and 1,500 tons of urea. Much of this output was already contracted for with Indian and Japanese customers. The balance was to be marketed in Southeast Asia and Africa.

Ras al-Khaimah immediately made plans to use the natural gas that was to be produced from the Emirates' new offshore oil-gas discovery, the Saleh 1-X well. Wheelabrator Technologies, a subsidiary of Signal Co. Inc. of the United States, was awarded a contract to design, build, and operate a 2,500-ton-per-day methanol plant using gas produced from the Saleh 1-X offshore discovery well and others to be drilled and operated by Gulf Oil Corp. of the United States. The Ras al-Khaimah government retained a majority interest in the joint venture. The plant was scheduled to be operational by the mid-1980's.

Petroleum.—*Exploration.*—The search for additional reserves of both oil and gas continued active and successful both onshore and offshore of several Emirates, including two that until 1983 had not shown any potential. In Ajman, a firm identified only as Reynolds Diversified was reported to have made a promising light oil and gas discovery in its onshore wildcat, Ajman No. 1. Testing was underway early in 1983, and two step-out wells were planned for later in the year. In Ras al-Khaimah, Gulf Marine Ras al-Khaimah Ltd. completed its discovery well, Saleh 1-X, in the Persian Gulf about 50 kilometers northwest of Ras al-Khaimah. The well tested at more than 5,800 barrels of 45.5° API oil and 27.5 million cubic feet per day of gas. Gulf Marine set a production target for the Saleh Field of 23,000 to 26,000 barrels per day by mid-1984. The concession was operated by Gulf Oil of the United States. Other partners were International Petroleum Corp. of Canada; a subsidiary of the Chinese Petroleum Corp. (Taiwan); and a group of European companies called Petrokal. Gulf Oil planned to drill at least two more wells on the structure during 1983.

Six oil exploration and production concessions on large blocks of onshore and offshore Dubai were awarded to various international oil exploration consortia during the year, foretelling considerable added seismic activity. The seventh and final parcel of open acreage in Dubai was awarded late in 1983 to the Dubai Petroleum Co.-Dubai Marine Areas Group (DPC-DUMA). The operator for DPC-DUMA was the Continental Oil Co. of the United States, holding a 30% interest in the group. Other interests included Compagnie Française des Pètroles, Hispánica de Petróleos S.A., Deutsche Texaco AG, Dubai Sun Oil Co., and Delfzee

Dubai Petroleum Co. DPC-DUMA performed more than 370 line miles of seismic work in offshore Dubai in 1983. Also, there was a great deal of exploratory drilling activity on both sides of Dubai's shoreline. Eight to ten wildcat wells were being drilled during the year.

Production.—The United Arab Emirates produced a daily average of 1,119,000 barrels of crude oil, compared with a 1982 average of 1,247,000 barrels. In 1981, daily average production was 1,502,000 barrels. The 2-year drop of slightly more than 25% could be traced to cutbacks in world demand. The United Arab Emirates in 1983 continued to be the Middle East's third largest crude producer behind Saudi Arabia and Iran. Among the 14 OPEC member nations, the United Arab Emirates was the sixth largest producer. Production ceilings set by OPEC continued to give the United Arab Emirates, among others, a problem in obtaining enough associated gas to meet contractual commitments. Fortunately, the country had large reserves of nonassociated gas it could call upon, and their development was well underway.

Three huge oil reservoirs lie offshore Abu Dhabi about 70 to 90 kilometers northwest of Abu Dhabi City. This cluster was the location of much development and redevelopment activity. The Zakum, Umm Shaif, and the much older El Bunduq Fields were producing large volumes of oil, and as development progressed, much greater production was anticipated in the immediately forthcoming years.

Production of crude oil from the Upper Zakum Reservoir began, as scheduled, during the first half of 1983 at an initial rate of 25,000 barrels per day. By yearend, production from the field, operated by ADNOC, was running between 70,000 and 80,000 barrels per day. Eventually, the field was expected by ADNOC to be capable of producing 500,000 barrels per day. After the first year's testing, the field was to produce, in accordance with OPEC production quotas, about 30,000 to 50,000 barrels per day.

Late in 1983, the Abu Dhabi Marine Operating Co. brought new operating facilities at its Lower Zakum and Umm Shaif Fields on-stream. Included were three 13-megawatt powerplants, a 220,000-barrel-per-day water injection facility and platform, and an accommodation platform where operating personnel were quartered. At Umm Shaif, another accommodation platform was dedicated. Several multimillion dollar contracts were awarded during the year for the hookup and pipeline transport of oil between the many offshore Zakum producing and utility platforms.

From Newbury, United Kingdom, a 200-ton separator package, mounted on special framework, was shipped via water for installation on the west satellite platform at Upper Zakum. Costing $1.7 million, the separator could process 170,000 barrels per day of fluids.

The westernmost oil reservoir in the offshore cluster was the Bunduq. The field straddles the offshore border between Abu Dhabi and Qatar and is shared between the two countries on a 50-50 basis. The field is operated by the Bunduq Oil Co., which is owned equally by three companies: United Petroleum Development Co. of Japan, British Petroleum Ltd. of the United Kingdom, and Compagnie Française des Pètroles. After a 4-year shut-in to install a $330 million water injection system for secondary recovery of large volumes of crude remaining in the reservoir, production was begun very late in 1983. Starting with withdrawal rates of about 6,000 to 10,000 barrels per day, the operator planned to increase production by 1985 to about 25,000 barrels per day.

In the far northern reaches of the United Arab Emirates, production of crude oil was scheduled to begin early in 1984 from the 421-square-kilometer Ras al-Khaimah offshore concession. In 1983, Gulf Offshore Ras al-Khaimah Ltd. drilled its Saleh 1-X discovery well, which tested at 5,852 barrels of 45° API oil and 27,510 million cubic feet of gas per day from a depth of 15,880 feet. The discovery well was drilled from a removable rig in 320 feet of water about 26 miles seaward of the Emirates' coast. The Gulf Offshore Group included Gulf Oil, International Petroleum, Overseas Petroleum & Investment Corp., and Petrokal. Gulf Oil was the operator and held a 50.46% interest. A step-out well, Saleh 2-X, was spudded on August 24, 1983, from a Zapata Offshore Co. Bonito II jack-up drilling rig. Saleh gas was to go to a 2,500-ton-per-day methanol plant in onshore Ras al-Khaimah.

Refining.—Abu Dhabi's first oil refinery, a 15,000-barrel-per-day plant at Umm al-Nar, was shut down on April 15, 1983, owing to inadequate capacity and obsolescence. In June, ADNOC commissioned its new 60,000-barrel-per-day Umm al-Nar refinery, and full operation began in July. The plant incorporated advanced technology, which at the time of its startup was present in only five other refineries in the world. This included a catalytic reforming unit with continuous-catalyst regeneration. Designed by the French Institute Français du Pètrole, the new refinery will require about one-half the customary downtime for annual maintenance. Refined products were to go from the refinery via pipeline to the Al Ain and Abu Dhabi International Airport, while other customers were to be served by highway tank trucks. Nearby, a jetty capable of taking small tankers will ensure supplies to the northern Emirates. The first tankers departed from the marine terminal in early September.

Across Abu Dhabi, at Ruwais, ADNOC was proceeding with plans to increase the capacity of its 120,000-barrel-per-day Ruwais refinery by adding a 46,000-barrel-per-day vacuum distillation unit and upgrading hydrocracking to provide 27,000 additional barrels per day of high-grade gasoline. Preliminary work on a hydrogen plant and $13 million worth of storage tanks was also underway.

Transportation.—Dubai's Port Jebel Ali, at the south end of the Persian Gulf, was the largest and most modern manmade port in the world. It was actively engaged in soliciting greater usage, especially by offshore oil operators and their service contractors. The port consisted of 15 kilometers of paved quays, some of which could handle vessels, including tankers, of up to 400,000 tons. Quayside water depths ranged from 11 to 14 meters. Tugs, mooring boats, an extensive communications facility, and ancillary service were available. The port also provided covered, open air, and refrigerated storage facilities, and was a major offshore petroleum operations base.

The Emirian Government resumed plans to study the construction of a pipeline that would bypass the Strait of Hormuz, the narrow body of water at the extreme south end of the Persian Gulf, which Iran had at one time threatened to block, thus stopping all petroleum shipments from the gulf. If constructed, the new line would serve the oilfields of Abu Dhabi and Dubai and would terminate at the new port under construction by Fujairah on its Indian Ocean coast. About 810,000 barrels per day of production in the two Emirates would be involved.

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[1] Physical scientist, Division of Foreign Data.

[2] Industries et Travaux d'Outremer (Paris, France). No. 350, Jan. 1983, Table B, p. 14.

The Mineral Industry of the United Kingdom

By Tatiana Karpinsky[1]

The United Kingdom's nonferrous metal processing and manufacturing industry continued to be one of the largest in Europe. Its major products were aluminum, both primary and secondary, secondary refined copper and lead, and primary zinc.[2] Tin mining in Cornwall supplied about 30% of the United Kingdom's tin requirements. Prospecting for a broad range of minerals continued throughout the country.

Assistance totaling $13 million[3] was approved by the Department of Industry for mineral exploration projects in Great Britain between February 24, 1972, when the Mineral Exploration and Investment Grants Act came into force, and March 31, 1983. The 11th annual report on the act, published by the Department of Industry on June 2, stated that 62 companies involved in mineral exploration in 219 projects have applied for assistance totaling $13 million. Of these projects, 110 were in England; 87, in Scotland; and 22, in Wales. In the year ended March 31, 1983, 11 companies (6 wholly British and 5 British subsidiaries of overseas companies) applied for $2 million worth of aid for 17 exploration projects or further stages of existing projects. Of these projects, 15 were for ores of nonferrous metals and 2 for barium minerals.

March oil tax cuts boosted oil and gas exploration to record levels. The British Government was trying to give oil companies a preview of the territories that will be offered in early 1985 with the ninth round of exploration and production licenses. Oil and gas investment accounted for about one-quarter of the total industrial investment in the United Kingdom. Oil production taxes provided the Government with about $12 billion per year or 6% of its revenue. Coal production from high-cost, low-productivity mines continued to be a crucial problem. The United Kingdom produced 20% more fuel than it used, as a result of increased production and lower demand, and the State-owned National Coal Board (NCB) announced a reduction of 4 million tons in the 1983-84 year rate of output compared with that of 1982, in order to bring coal production nearer to demand.

PRODUCTION

Output of aluminum, copper, lead, nickel, and zinc were all higher, but production of tin from domestic ore and production of silver remained almost unchanged. Development of the tungsten mine at Hemerdon, however, continued to await an improvement in the market conditions. Production of nonmetals remained almost unchanged, but the labor force at several plants was reduced severely.

Steel production increased about 10% compared with that of 1982 and amounted to 15 million tons. In 1983, deep-mined coal production decreased by 4.2% compared with the 1982 level, and opencast coal production decreased 3.7%. Crude oil production increased considerably, by 8%, compared with that of 1982. The United Kingdom was a net exporter of crude oil and produced about 80% of its natural gas needs. Much of the development of North Sea hydrocarbon resources was by foreign companies, primarily from the United States, under license.

Table 1.—United Kingdom: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum:					
Alumina	88,000	102,000	90,000	88,000	90,000
Metal:					
Primary	359,474	374,446	339,183	240,800	250,000
Secondary	176,696	162,056	148,009	114,600	130,000
Cadmium including secondary	424	375	278	354	340
Copper:					
Ore and concentrate, metal content	[e]100	200	700	649	600
Metal, refined:					
Primary	48,512	68,290	59,834	63,200	67,500
Secondary	73,185	93,048	76,329	71,000	76,800
Total	121,697	161,338	136,163	134,200	144,300
Iron and steel:					
Iron ore:					
Gross weight thousand tons	4,268	916	731	470	384
Iron content do.	1,110	238	161	103	82
Metal:					
Pig iron do.	12,894	6,412	9,470	8,327	9,500
Ferroalloys, blast furnace: Ferromanganese do.	136	52	84	61	83
Steel, crude do.	[r]21,464	[r]11,272	[r]15,573	13,704	15,000
Semimanufactures do.	17,396	10,335	13,241	15,139	16,000
Lead:					
Mine output, metal content	4,701	[r]3,600	[r]7,000	3,993	[2]4,000
Metal:					
Smelter:					
Primary[3]	32,314	30,039	26,556	34,079	[2]40,740
Secondary (refined)[4]	244,192	211,385	197,992	175,210	[2]185,288
Total	276,506	241,424	224,548	209,289	[2]226,028
Refined:					
Primary[5]	124,138	113,405	135,369	130,984	[2]136,908
Secondary[4]	244,192	211,385	197,992	175,210	[2]185,288
Total	368,330	324,790	333,361	306,194	[2]322,196
Magnesium metal including secondary	2,700	2,700	1,900	1,758	1,800
Nickel metal, refined	18,863	19,300	25,400	6,900	24,000
Silver metal thousand troy ounces	NA	NA	61	105	90
Tin:					
Mine output metal content	2,373	2,982	3,869	[r]4,208	4,100
Metal:					
Primary	8,025	5,829	6,839	8,200	6,300
Secondary	3,367	5,535	6,071	5,400	6,500
Tungsten, mine output, metal content	66	[e]70	NA	NA	NA
Zinc:					
Ore and concentrate, metal content	572	4,400	10,900	10,186	9,000
Metal, smelter	76,686	86,682	81,650	79,300	87,700
NONMETALS					
Barite and witherite	45,000	54,000	63,000	81,000	85,000
Bromine	29,200	26,400	27,600	29,800	30,000
Calcite	21,000	18,000	18,000	18,000	18,000
Cement, hydraulic thousand tons	16,140	[r]14,805	[r]12,729	12,962	13,396
Chalk do.	16,265	14,049	11,756	11,616	12,000
Clays:					
Fire clay do.	1,711	1,217	992	850	950
Fuller's earth do.	220	210	205	243	250
Kaolin (china clay) do.	4,444	3,964	3,800	3,558	3,600
Pottery clay and ball clay do.	22	14	23	43	40
Other including clay shale do.	21,644	19,811	[r]18,776	20,280	22,000
Diatomite[e] do.	1	1	1	1	1
Feldspar (china stone)[e] do.	50	50	50	50	50
Fluorspar, all grades do.	139	171	116	98	200
Gypsum and anhydrite[6] do.	3,500	3,447	2,944	2,741	3,100
Lime: Quicklime and hydrated lime do.	3,310	3,980	[e]3,000	[e]3,000	3,000
Nitrogen: N content of ammonia do.	1,666	1,633	1,780	1,716	1,700
Potash, K_2O equivalent do.	277	321	285	401	302
Refractory products:[7]					
Brick do.	681	491	--	NA	NA
Cement do.	66	47	NA	NA	NA
Other do.	462	375	NA	NA	NA
Salt:					
Brine (in brine for purposes other than saltmaking) do.	1,915	1,608	1,454	1,554	1,500
Rock do.	1,590	1,746	1,350	2,209	2,200
Other do.	4,315	3,800	3,916	3,874	3,900
Sodium compounds: Sodium carbonate[e] do.	1,400	1,360	1,300	1,300	1,300

See footnotes at end of table.

Table 1.—United Kingdom: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Stone, sand and gravel:					
Chert and flint thousand tons	47	14	10	[e]10	10
Igneous rock do.	36,178	34,676	30,772	36,138	39,000
Limestone and dolomite do.	[r]92,194	88,773	79,067	85,450	92,000
Sandstone including ganister do.	13,544	12,597	12,233	13,336	14,000
Slate do.	513	225	350	785	300
Crushed rock, not further described do.	102,991	102,533	92,000	102,848	111,000
Sand and gravel:					
Common sand and gravel do.	[r]11,500	104,467	[r]97,000	97,753	106,000
Special sands do.	5,829	5,708	4,451	4,123	4,150
Strontium minerals	6,100	6,700	[r]14,500	[e]18,000	18,000
Sulfur, byproduct:					
Of metallurgy[e] thousand tons	56	50	50	50	50
Of spent oxides do.	4	4	4	[e]4	4
Of petroleum refinery do.	[r]80	80	75	59	60
Total do.	[r]140	[e]134	[e]129	[e]113	114
Talc, soapstone, pyrophyllite	16,600	17,300	18,000	19,000	19,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black thousand tons	200	172	153	[e]150	150
Coal:					
Anthracite do.	3,030	2,902	[r]2,909	2,884	2,700
Bituminous and other do.	[r]119,370	[r]127,198	[r]124,591	121,816	115,300
Coke:					
Metallurgical do.	10,259	7,829	[r]7,367	7,203	7,000
Breeze, all types do.	853	673	603	502	500
Fuel briquets, all grades do.	2,389	2,484	2,065	1,933	1,800
Gas:					
Natural:					
Gross million cubic feet	[r]1,363,669	1,287,899	1,284,141	1,263,341	1,430,000
Marketed do.	1,410,285	2,316,878	1,320,762	NA	NA
Natural gas liquids thousand 42-gallon barrels	[r]5,406	7,865	13,700	27,840	37,400
Petroleum:					
Crude including field condensate do.	[r]564,755	[r]581,758	[r]646,800	740,644	798,000
Refinery products:					
Gasoline do.	[r]137,540	[r]141,764	[r]146,197	163,031	[2]179,324
Jet fuel do.	[r]41,888	[r]41,584	36,472	35,656	[2]37,784
Kerosine do.	20,995	15,764	14,756	14,345	[2]13,718
Distillate fuel oil do.	189,850	165,261	[r]152,259	153,534	[2]156,876
Residual fuel oil do.	190,476	157,842	127,000	105,281	[2]89,797
Lubricants do.	9,310	8,750	7,441	6,930	[2]6,552
Other do.	[r]89,967	[r]65,938	63,178	63,945	[2]64,662
Refinery fuel and losses do.	[r]51,215	[r]50,288	[r]44,441	47,499	[2]44,999
Total do.	[r]731,241	[r]647,191	[r]591,744	590,221	[2]593,712

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1] Includes data available through June 5, 1984.

[2] Reported figure.

[3] Bullion produced entirely from imported ore.

[4] Includes a small quantity of primary lead from domestic ore.

[5] Produced entirely from imported bullion and includes antimonial lead product.

[6] Excludes plasters.

[7] Consists of brick, retorts, molds, and other refractory products made from clays, silica, siliceous materials, magnesite, alumina, and chrome materials.

TRADE

Total exports reached $85 billion in 1983. The main products exported including alloys and semifinished products were copper, nickel, aluminum, lead, tin, and zinc. Exports of aluminum and aluminum alloys reached $413 million, while exports of copper, brass, and other copper alloys reached $306 million. Exports of silver, platinum, and other metals of the platinum group totaled over $1,423 million. The major export markets for the whole metal industry were the United States and the rest of the European Economic Community (EEC).

In 1982, exports of petroleum, petroleum products, and related materials reached $16 billion or 19% of total exports; exports of coal, coke, gas, and electric energy reached $845 million or 1% of the total. In 1983, exports of mineral fuels and related materials were approximately the same as in 1982. Overseas trade figures for 1983 indicated that there was a surplus in the balance of payments.

Table 2.—United Kingdom: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	883	749	5	Sweden 553; Brazil 60.
Oxides and hydroxides	39,662	37,018	696	Republic of South Africa 4,555; Portugal 3,618; Norway 3,488.
Ash and residue containing aluminum	1,746	1,873	--	Netherlands 983; West Germany 485.
Metal including alloys:				
Scrap	38,008	60,351	398	West Germany 34,304; Netherlands 5,981; France 5,807.
Unwrought	168,537	119,517	418	West Germany 37,926; Netherlands 31,183; Belgium-Luxembourg 12,147.
Semimanufactures	81,395	98,675	6,694	West Germany 14,724; France 11,247; Ireland 9,921.
Antimony: Metal including alloys, all forms	30	118	NA	Belgium-Luxembourg 24; West Germany 17.
Arsenic: Oxides and acids	3,603	2,468	463	New Zealand 1,372; Malaysia 321.
Beryllium: Metal including alloys, all forms	11	1	(2)	Mainly to France.
Bismuth: Metal including alloys, all forms	311	320	84	Canada 54; France 46; West Germany 43.
Cadmium: Metal including alloys, all forms	37	136	17	Belgium-Luxembourg 38; West Germany 23.
Chromium:				
Ore and concentrate	1,192	980	--	Sweden 282; Netherlands 232; Spain 180.
Oxides and hydroxides	1,773	2,745	1,135	France 830; Canada 214.
Metal including alloys, all forms	2,123	1,945	940	West Germany 203; Switzerland 83; Netherlands 82.
Cobalt:				
Oxides and hydroxides	838	500	57	Belgium-Luxembourg 105; France 75.
Metal including alloys, all forms	810	514	99	Netherlands 137; West Germany 52; France 38.
Columbium and tantalum: Metal including alloys, all forms:				
Columbium (niobium)	17	(2)	NA	NA.
Tantalum	12	6	3	France 1; West Germany 1.
Copper:				
Ore and concentrate	4	39	--	West Germany 20; Sweden 10.
Matte and speiss including cement copper	--	76	--	Netherlands 20; Ireland 19.
Oxides and hydroxides	255	454	46	Australia 111; Netherlands 50.
Sulfate	4,803	6,100	19	Nigeria 3,003; Guinea 1,493.
Ash and residue containing copper	4,914	9,138	--	West Germany 5,629; Spain 1,695.
Metal including alloys:				
Scrap	65,562	92,718	692	West Germany 37,929; Italy 18,891; Belgium-Luxembourg 17,355.
Unwrought	43,035	32,643	462	West Germany 9,457; Italy 6,921; Sweden 3,902.
Semimanufactures	97,747	102,468	5,332	Ireland 11,626; Switzerland 9,366; Kuwait 7,031.
Germanium: Metal including alloys, all forms	1	4	2	NA.
Gold:				
Waste and sweepings value, thousands	$28,480	$35,073	NA	Spain $29,158.
Metal including alloys, unwrought and partly wrought thousand troy ounces	22,213	19,137	NA	NA.
Iron and steel:				
Iron ore and concentrate, excluding roasted pyrite	20,033	685	--	Cuba 316; United Arab Emirates 150.
Metal:				
Scrap thousand tons	3,367	3,052	1	Spain 2,129; Sweden 191.
Pig iron, cast iron, related materials	38,156	32,583	130	Belgium-Luxembourg 6,155; Sweden 5,960; France 4,360.
Ferroalloys:				
Ferromanganese	21,588	23,902	15,221	West Germany 2,807; Canada 2,038.
Ferrosilicon	2,889	1,173	NA	West Germany 204.
Silicon metal	193	350	--	West Germany 93; Netherlands 45; Switzerland 30.
Unspecified	12,774	11,482	298	West Germany 2,881; Italy 1,505.
Steel, primary forms	273,313	331,897	71,795	West Germany 60,320; Italy 52,880; Greece 44,857.
Semimanufactures:				
Bars, rods, angles, shapes, sections	1,625,000	1,332,604	186,785	West Germany 125,084; India 103,288; Ireland 84,915.
Universals, plates, sheets	1,240,000	980,428	40,417	India 103,467; West Germany 99,495; Denmark 63,357.
Hoop and strip	98,579	106,970	8,693	Ireland 12,732; France 11,789; U.S.S.R. 11,668.
Rails and accessories	125,781	120,869	16,040	Italy 17,819; New Zealand 11,838; India 7,997.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Semimanufactures —Continued				
Wire	96,727	93,473	12,884	Ireland 10,482; West Germany 4,864; Republic of South Africa 4,605.
Tubes, pipes, fittings	795,320	669,332	64,981	Trinidad and Tobago 67,158; Netherlands 45,704; Denmark 42,901.
Castings and forgings, rough	82,342	52,643	9,978	Sweden 8,179; France 6,145; West Germany 4,999.
Lead:				
Ore and concentrate	2,378	2,496	--	Belgium-Luxembourg 2,399.
Oxides	6,423	5,376	1	Ireland 2,115; Nigeria 583.
Ash and residue containing lead	5,400	5,149	--	Denmark 3,610; India 451.
Metal including alloys:				
Scrap	18,221	22,607	--	West Germany 6,524; Ireland 6,008; Italy 4,479.
Unwrought	130,120	128,036	1,035	West Germany 46,059; France 10,946; Italy 10,798.
Semimanufactures	2,063	2,213	78	Ireland 411; Saudi Arabia 313; Italy 279.
Lithium:				
Oxides and hydroxides	7	98	NA	Netherlands 54.
Metal including alloys, all forms	3	17	--	Switzerland 11.
Magnesium: Metal including alloys:				
Scrap	182	341	1	Netherlands 159; Italy 92.
Unwrought	757	971	412	France 161; Canada 125.
Semimanufactures	638	754	4	Saudi Arabia 133; Ireland 112; United Arab Emirates 74.
Manganese:				
Ore and concentrate, metallurgical-grade	6,197	6,659	5	Republic of South Africa 2,152; Italy 1,777; Nigeria 1,418.
Oxides	341	1,004	--	Italy 254; Ireland 168.
Metal including alloys, all forms	147	878	18	West Germany 195; France 147; Venezuela 81.
Mercury 76-pound flasks	2,030	6,177	NA	Netherlands 4,379; Belgium-Luxembourg 435.
Molybdenum:				
Ore and concentrate	4,257	5,769	--	Netherlands 2,842; Spain 1,112; Austria 513.
Oxides and hydroxides	1,086	1,854	NA	West Germany 758; Austria 386; Netherlands 252.
Metal including alloys, all forms	196	374	27	Netherlands 119; West Germany 44; Sweden 39.
Nickel:				
Ore and concentrate	61	1	--	NA.
Matte and speiss	4,941	2,010	13	Norway 1,825; France 56.
Oxides and hydroxides	162	294	--	Netherlands 160; West Germany 30.
Ash and residue containing nickel	3,402	1,515	NA	Australia 717; Canada 201.
Metal including alloys:				
Scrap	4,195	5,136	133	Spain 2,264; Sweden 1,246; West Germany 455.
Unwrought	20,379	11,426	253	West Germany 3,212; Belgium-Luxembourg 1,959; Sweden 1,090.
Semimanufactures	9,735	7,842	614	France 1,437; Japan 934; Belgium-Luxembourg 836.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, unspecified thousand troy ounces	1,382	1,415	450	Switzerland 225; West Germany 193; Japan 129.
Selenium, elemental	194	107	17	Spain 21; France 19.
Silver:				
Ore and concentrate[3] value, thousands	$414	$127	--	India $47; Israel $34; Netherlands $25.
Waste and sweepings[3] do	$28,159	$10,400	$226	West Germany $5,022; Belgium-Luxembourg $3,434.
Metal including alloys, unwrought and partly wrought thousand troy ounces	61,312	85,457	25,946	Switzerland 25,843; West Germany 11,189; Canada 7,234.
Tellurium and arsenic	10	58	NA	NA.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Tin:				
Ore and concentrate	4,306	1,866	1	Spain 754; Netherlands 644; Malaysia 236.
Oxides	481	385	82	Spain 134; Netherlands 63.
Ash and residue containing tin	1,304	397	--	West Germany 256; Spain 87.
Metal including alloys:				
Scrap	143	356	--	West Germany 283; Netherlands 20.
Unwrought	7,699	6,610	60	Belgium-Luxembourg 4,238; West Germany 571; Netherlands 372.
Semimanufactures	369	493	7	Barbados 65; Jamaica 59; Italy 55.
Titanium:				
Ore and concentrate	344	970	--	Netherlands 620; Belgium-Luxembourg 222.
Oxides	12,502	10,494	1,733	Japan 1,337; Hungary 952; West Germany 924.
Metal including alloys, all forms value, thousands	$20,405	$6,804	NA	NA.
Tungsten:				
Ore and concentrate	662	1,364	9	West Germany 665; U.S.S.R. 524.
Oxides and hydroxides	20	167	NA	Bulgaria 162.
Ash and residue containing tungsten	43	18	NA	NA.
Metal including alloys, all forms	346	421	48	West Germany 103; Singapore 72; France 48.
Uranium and/or thorium:				
Ore and concentrate value, thousands	$2	$231	--	France $229.
Metals including alloys, all forms	10	4	--	All to West Germany.
Vanadium:				
Oxides and hydroxides	102	56	NA	NA.
Ash and residue containing vanadium	31	112	112	
Metal including alloys, all forms	--	17	NA	West Germany 7.
Zinc:				
Ore and concentrate	26,297	18,576	--	France 10,676; Belgium-Luxembourg 7,857.
Oxides	9,972	8,179	93	Belgium-Luxembourg 1,591; Ireland 1,334.
Blue powder	1,970	2,747	670	NA.
Matte	1,179	1,230	--	West Germany 681; Spain 356.
Ash and residue containing zinc	14,048	26,808	--	Austria 15,000; Netherlands 7,626.
Metal including alloys:				
Scrap	8,441	11,034	--	West Germany 6,770; France 1,089; Netherlands 1,069.
Unwrought	33,177	17,506	3,816	France 4,479; Netherlands 2,375; West Germany 1,441.
Semimanufactures	3,098	5,498	NA	Nigeria 2,030; Iran 1,510.
Zirconium: Ore and concentrate	748	539	--	Belgium-Luxembourg 144; Switzerland 125; West Germany 123.
Other:				
Ores and concentrates	^{r}14	60	--	Belgium-Luxembourg 14.
Oxides and hydroxides	1,139	2,742	198	West Germany 562; France 338.
Ashes and residues	^{r}11,302	11,607	478	Belgium-Luxembourg 6,325; Sweden 2,383.
Base metals including alloys, all forms	^{r}214	45	3	West Germany 13; France 10.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	3,071	1,300	NA	NA.
Artificial: Corundum	5,484	4,510	1,249	Sweden 821; West Germany 548; Netherlands 349.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$4,390	$3,283	$423	India $528; Ireland $386; Japan $335.
Grinding and polishing wheels and stones	6,584	4,687	94	France 1,081; Sweden 558; West Germany 303.
Asbestos, crude	1,758	1,860	--	West Germany 571; Poland 386; Italy 312.
Barite and witherite	4,226	11,427	--	Norway 4,171; West Germany 2,211; Cuba 1,883.
Boron materials:				
Crude natural borates	1,167	82	--	Ireland 60.
Oxides and acids	1,142	814	10	Netherlands 766; Japan 19.
Bromine	1,350	2,151	--	France 1,003; Sweden 419; West Germany 314.
Cement	557,000	306,734	66	Nigeria 238,221; Ireland 15,640.
Chalk	52,615	37,848	607	Nigeria 10,479; Australia 3,467.
Clays, crude: Unspecified thousand tons	5,626	2,501	16	West Germany 454; Finland 346; Italy 320.
Cryolite and chiolite	1	16	--	Singapore 10; Ireland 3.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Diamond:				
Gem, not set or strung value, thousands	$1,700,000	$1,605,261	$186,153	Belgium-Luxembourg $614,893; Switzerland $349,917; India $204,515.
Industrial do	$49,976	$38,052	$8,191	Belgium-Luxembourg $8,942; Ireland $4,995; Romania $2,540.
Diatomite and other infusorial earth	1,367	377	24	Denmark 124; Ireland 46; Egypt 41.
Feldspar, fluorspar, related materials	30,473	18,813	19	Netherlands 13,650; West Germany 1,600.
Fertilizer materials:				
Crude, n.e.s	3,051	5,181	300	Ireland 3,279; West Germany 1,123.
Manufactured:				
Ammonia	240,349	301,998	1	Spain 119,137; Denmark 45,102; Belgium-Luxembourg 42,848.
Nitrogenous	206,399	147,384	100	Netherlands 44,036; West Germany 22,423; Belgium-Luxembourg 19,908.
Phosphatic	10,251	2,170	--	Ireland 1,008; New Zealand 558.
Potassic	92,531	77,684	291	Norway 39,194; Netherlands 17,298; Finland 14,935.
Unspecified and mixed	321,911	238,784	1,783	Ireland 133,041; West Germany 64,533.
Graphite, natural	2,923	2,956	142	France 837; West Germany 416; Spain 345.
Gypsum and plaster	18,412	16,523	47	Ireland 3,729; Australia 2,312.
Iodine	106	132	NA	France 46; Netherlands 6.
Lime	35,980	32,163	--	Nigeria 10,149; Ireland 4,459.
Magnesium compounds: Other	71,570	65,612	NA	NA.
Mica:				
Crude including splittings and waste	2,926	3,448	3	West Germany 869; Netherlands 608.
Worked including agglomerated splittings	82	60	2	West Germany 10; Poland 7; Switzerland 7.
Nitrates, crude	2,098	132	--	Ireland 82; Tanzania 25.
Phosphates, crude	785	966	70	Australia 374; Ireland 209; Canada 70.
Pigments, mineral:				
Natural, crude	1,450	1,601	18	Libya 460.
Iron oxides and hydroxides, processed	5,571	6,700	200	Republic of South Africa 927; Saudi Arabia 442; Hungary 421.
Potassium salts, crude	20	213	3	Saudi Arabia 146; Ireland 38.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$139,899	$92,834	$15,466	Switzerland $39,942; France $9,675.
Synthetic do	$1,194	$126	$13	France $40; Spain $33.
Pyrite, unroasted	1,653	72	--	Italy 39; France 22.
Salt and brine	426,479	484,659	350	Nigeria 154,243; Sweden 122,439; Ireland 100,202.
Sodium compounds, n.e.s.: Carbonate, manufactured	135,482	162,093	18	Republic of South Africa 68,107; Saudi Arabia 19,910; Ireland 19,100.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	6,443	2,151	35	France 614; Ireland 453.
Worked	7,703	7,469	670	Ireland 1,319; Belgium-Luxembourg 867; France 679.
Dolomite, chiefly refractory-grade	18,580	14,616	--	Norway 4,861; Sweden 4,533.
Gravel and crushed rock thousand tons	3,208	3,628	([2])	Belgium-Luxembourg 1,847; France 942; Netherlands 468.
Limestone other than dimension	547,907	625,647	--	Belgium-Luxembourg 191,575; Norway 118,557; West Germany 96,171.
Quartz and quartzite	138	201	5	Singapore 57; United Arab Emirates 56.
Sand other than metal-bearing	43,026	50,151	4,544	Ireland 23,271; Sweden 14,045.
Sulfur:				
Elemental:				
Crude including native and byproduct	1,095	1,201	1	Republic of South Africa 549; Ireland 153; France 109.
Colloidal, precipitated, sublimed	128	295	3	Ireland 136; Australia 64.
Dioxide	91	117	NA	NA.
Sulfuric acid	69,679	77,607	2	Ireland 27,749.
Talc, steatite, soapstone, pyrophyllite	6,902	3,573	--	Netherlands 943; Nigeria 867; Ireland 659.
Vermiculite	515	974	NA	NA.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Other:				
Crude	[r]34,676	25,529	163	West Germany 6,663; Netherlands 6,226.
Slag and dross, not metal-bearing	91,311	68,674	153	West Germany 45,809; Finland 9,774.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,865	3,171	15	Ireland 707; Netherlands 508.
Carbon: Carbon black	29,499	37,475	77	West Germany 5,586; Nigeria 4,893; Ireland 3,584.
Coal:				
Anthracite thousand tons	[r]893	552	--	Netherlands 195; France 193.
Bituminous do	[r]8,620	6,837	(2)	Denmark 2,057; France 1,718.
Briquets of anthracite and bituminous coal do	104	126	--	Norway 86; Venezuela 14.
Coke and semicoke do	3,391	1,416	--	Romania 473; Belgium-Luxembourg 184; Norway 184.
Peat including briquets and litter	4,198	7,232	--	France 3,051; Egypt 1,357.
Petroleum:				
Crude thousand 42-gallon barrels	394,036	453,518	160,876	Netherlands 98,074; West Germany 57,832; France 30,627.
Refinery products:				
Liquefied petroleum gas do	12,602	16,783	889	Netherlands 4,730; France 1,469.
Gasoline:				
Aviation do	11,339	17,920	763	Ireland 7,746; France 2,175.
Motor do	8,541	9,577	163	Netherlands 2,928; Sweden 2,428.
Mineral jelly and wax do	381	290	17	West Germany 93; Nigeria 51.
Kerosine and jet fuel do	4,298	3,902	(2)	Ireland 2,375; Denmark 273.
Distillate fuel oil do	38,147	35,450	1,933	Ireland 7,977; France 6,951.
Lubricants do	5,061	4,834	120	Nigeria 563; West Germany 386.
Residual fuel oil do	25,803	22,713	592	Netherlands 7,775; Ireland 5,432.
Bitumen and other residues do	502	552	--	Ireland 478; Iceland 64.
Bituminous mixtures do	234	204	1	Ireland 39; Greece 20.
Petroleum coke do	2,054	1,798	NA	NA.

[r]Revised. NA Not available.

[1] Table prepared by Jozef Plachy.

[2] Less than 1/2 unit.

[3] May include other precious metals.

Table 3.—United Kingdom: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkaline metals	53	296	--	West Germany 290.
Aluminum:				
Ore and concentrate	240,687	310,130	80	Ghana 92,963; Brazil 79,503; Guinea 78,157.
Oxides and hydroxides	636,159	457,033	6,228	Jamaica 370,763; Italy 52,053.
Ash and residue containing aluminum	653	304	--	Switzerland 119; West Germany 54.
Metal including alloys:				
Scrap	4,040	4,085	43	Ireland 3,037; France 296.
Unwrought	123,347	154,833	652	Norway 99,308; France 14,615.
Semimanufactures	169,504	209,211	15,631	West Germany 62,064; Belgium-Luxembourg 33,076; France 29,424.
Antimony: Metal including alloys, all forms	253	297	--	China 181; Belgium-Luxembourg 44.
Beryllium:				
Oxides and hydroxides	3	6	6	
Metal including alloys, all forms	3	1	1	

See footnotes at end of table.

Table 3.—United Kingdom: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Bismuth: Metal including alloys, all forms	292	351	--	Republic of Korea 64; Peru 42; Bulgaria 38.
Cadmium: Metal including alloys, all forms	982	846	--	Canada 253; Japan 222; Finland 161.
Cesium and rubidium: Metal including alloys, all forms ______ kilograms	53	63	--	NA.
Chromium:				
Ore and concentrate	76,495	64,547	--	Republic of South Africa 52,465; Cyprus 5,400.
Oxides and hydroxides	2,309	3,054	100	West Germany 2,035; U.S.S.R. 481.
Metal including alloys, all forms	1	38	NA	NA.
Cobalt:				
Oxides and hydroxides	891	363	1	Canada 331.
Metal including alloys, all forms	1,439	1,219	78	Zambia 435; Belgium-Luxembourg 152; Norway 129.
Columbium and tantalum: Metal including alloys, all forms:				
Columbium (niobium)	(2)	12	3	West Germany 9.
Tantalum	36	32	14	West Germany 14; France 2.
Copper:				
Ore and concentrate	561	683	2	Czechoslovakia 517; Canada 55.
Matte and speiss including cement copper	9	4	--	All from Philippines.
Oxides and hydroxides	2,228	1,613	--	Australia 738; Norway 617.
Ash and residue containing copper	8,690	50,098	219	Sweden 44,945; Netherlands 2,282.
Metal including alloys:				
Scrap	8,142	10,021	991	Republic of South Africa 3,013; Ireland 1,342; Ghana 691.
Unwrought	283,803	324,880	3,581	Canada 72,049; Chile 61,897; Peru 50,565.
Semimanufactures	88,494	99,927	2,091	West Germany 37,069; France 18,612.
Germanium: Metal including alloys, all forms	1	6	--	France 2; Bulgaria 1.
Gold:				
Waste and sweeping value, thousands	$148,751	$128,994	$106,418	Sweden $8,159.
Metal including alloys, unwrought and partly wrought thousand troy ounces	20,643	17,435	45	Switzerland 183; Singapore 132; unspecified 16,741.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	14,582	10,572	--	Canada 3,817; Brazil 1,903; Australia 1,499.
Pyrite, roasted	265,906	210,265	--	Sweden 203,436.
Metal:				
Scrap	20,760	37,317	793	Canada 17,510; Ireland 10,766.
Pig iron, cast iron, related materials	128,716	167,940	158	Brazil 40,811; West Germany 38,433.
Ferroalloys:				
Ferromanganese	56,412	58,031	--	Republic of South Africa 29,500; Norway 16,293.
Ferrosilicon	75,443	75,484	NA	NA.
Unspecified	103,829	124,743	173	Republic of South Africa 30,207; Norway 26,089.
Steel, primary forms	739,113	875,068	924	West Germany 373,449; Netherlands 149,509.
Semimanufactures:				
Bars, rods, angles, shapes, sections	769,479	952,256	3,030	West Germany 135,287; France 132,025; Belgium-Luxembourg 112,426.
Universals, plates, sheets	^{r}1,311,663	1,497,239	19,956	West Germany 360,476; Belgium-Luxembourg 230,120; Netherlands 227,568.
Hoop and strip	136,645	134,162	1,542	West Germany 65,303; Belgium-Luxembourg 21,655; France 14,396.
Rails and accessories	3,960	12,933	42	West Germany 8,829; Netherlands 1,618.
Wire	54,193	56,176	443	Belgium-Luxembourg 17,828; France 11,235; West Germany 9,908.
Tubes, pipes, fittings	651,610	404,264	6,722	Italy 92,590; West Germany 75,897; Netherlands 46,280.
Castings and forgings, rough	18,346	19,961	322	West Germany 6,675; France 2,213.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Lead:				
Ore and concentrate	59,832	39,216	--	Canada 20,697; Netherlands 6,450; Australia 5,569.
Oxides	736	755	1	West Germany 354; Netherlands 350.
Ash and residue containing lead	6,947	8,830	1,863	Canada 1,869; West Germany 1,137.
Metal including alloys:				
Scrap	788	953	288	West Germany 120; Ireland 105.
Unwrought	162,443	173,649	88	Australia 121,193; Canada 33,268.
Semimanufactures	2,725	5,016	34	Ireland 2,930; West Germany 1,008.
Lithium: Oxides and hydroxides	340	1,046	266	China 139; West Germany 101.
Magnesium: Metal including alloys:				
Scrap	39	16	--	Netherlands 10; Ghana 5.
Unwrought	4,900	4,288	343	Netherlands 1,838; Norway 1,546.
Semimanufactures	243	509	130	Canada 132.
Manganese:				
Ore and concentrate, metallurgical-grade	278,055	178,945	--	Republic of South Africa 96,721; Brazil 44,818; Congo 23,800.
Oxides	3,924	4,524	234	Ireland 1,853; Belgium-Luxembourg 1,820.
Metal including alloys, all forms	1,962	2,741	121	Republic of South Africa 1,404; Netherlands 557; Mozambique 217.
Mercury 76-pound flasks	6,003	7,569	783	Netherlands 3,451; Spain 1,595; West Germany 754.
Molybdenum:				
Ore and concentrate	15,148	17,738	7,213	Chile 4,166; Canada 2,688.
Oxides and hydroxides	432	195	--	Netherlands 97; Belgium-Luxembourg 49.
Metal including alloys, all forms	178	179	32	Austria 63; China 26; France 14.
Nickel:				
Ore and concentrate	179	--		
Matte and speiss	41,233	15,015	20	Canada 12,011; Australia 2,667.
Oxides and hydroxides	257	216	41	Canada 61; Netherlands 59.
Ash and residue containing nickel	929	575	148	Belgium-Luxembourg 134; Netherlands 117.
Metal including alloys:				
Scrap	2,432	3,359	1,210	West Germany 409; Netherlands 386.
Unwrought	17,160	15,252	40	Netherlands 4,901; Canada 3,711.
Semimanufactures	2,570	2,527	621	West Germany 962; France 437.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	385,812	643,020	32,151	Republic of South Africa 353,661.
Rare-earth metals including alloys, all forms	33	12	--	West Germany 10.
Silver:				
Ore and concentrate[3] value, thousands	$354,386	$170,445	NA	NA.
Waste and sweepings[3] do	$334,393	$175,617	NA	NA.
Metal including alloys, unwrought and partly wrought thousand troy ounces	63,241	46,940	321	East Germany 10,449; Mexico 5,659; Australia 5,530.
Tin:				
Ore and concentrate	38,407	20,386	115	Bolivia 14,392; Republic of South Africa 1,746.
Ash and residue containing tin	13,180	12,072	4,694	West Germany 2,782; Belgium-Luxembourg 1,799.
Metal including alloys:				
Scrap	1,005	1,533	562	Poland 233; Japan 145.
Unwrought	8,151	7,630	167	Nigeria 1,596; Indonesia 1,451; Netherlands 1,213.
Semimanufactures	102	94	3	West Germany 29; France 14.
Titanium:				
Ore and concentrate	288,700	354,873	--	Australia 231,777; Canada 64,838.
Oxides	9,636	8,304	3,777	West Germany 2,184; Belgium-Luxembourg 799.
Metal including alloys, all forms	[4]2,083	1,564	505	Japan 653; West Germany 136.
Tungsten:				
Ore and concentrate	3,308	1,768	21	Bolivia 717; West Germany 303.
Oxides and hydroxides	11	244	--	China 150; Republic of Korea 64.
Ash and residue containing tungsten	166	41	--	Sweden 29.
Metal including alloys, all forms	162	245	28	Austria 69; Republic of Korea 32.
Uranium and/or thorium:				
Ore and concentrate	2,492	1,826	--	Australia 1,534; Netherlands 292.
Oxides and other compounds value, thousands	$85	$114	NA	NA.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Vanadium:				
Oxides and hydroxides	1,075	745	--	Finland 709.
Metal including alloys, all forms	--	41	--	All from West Germany.
Zinc:				
Ore and concentrate	131,803	166,084	--	Peru 64,041; Australia 50,348; Ireland 42,498.
Oxides	3,015	4,514	8	West Germany 2,252; Italy 587.
Blue powder value, thousands	$1,586	$2,922	NA	Belgium-Luxembourg $2,237.
Matte	1,165	48	--	Nigeria 18.
Ash and residue containing zinc	5,439	2,374	974	Canada 519; West Germany 287.
Metal including alloys:				
Scrap	925	2,065	--	Belgium-Luxembourg 705; Finland 591.
Unwrought	120,278	128,669	1	Canada 38,741; Netherlands 32,867; Finland 24,329.
Semimanufactures value, thousands	$6,142	$5,845	$422	West Germany $3,357.
Zirconium:				
Ore and concentrate	27,615	36,792	81	Australia 24,770; Republic of South Africa 11,723.
Metal including alloys, all forms	112	81	55	West Germany 11.
Other:				
Ores and concentrates	305	308	--	Republic of South Africa 284.
Oxides and hydroxides	^{r}2,503	2,652	NA	NA.
Ashes and residues	^{r}9,764	6,975	NA	NA.
Base metal including alloys, all forms	^{r}635	199	54	Sweden 87; Belgium-Luxembourg 27.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	241,208	183,466	NA	NA.
Artificial: Corundum	10,687	18,874	117	Canada 12,232; Netherlands 2,397.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$13,975	$13,269	NA	NA.
Grinding and polishing wheels and stones	4,944	5,302	143	France 885; Netherlands 852; West Germany 744.
Asbestos, crude	67,187	52,260	330	Canada 40,656; Zimbabwe 4,193.
Barite and witherite	113,007	116,386	7	Ireland 53,328; Morocco 36,199.
Boron materials:				
Crude natural borates	9,937	--		
Oxides and acids	3,696	2,976	8	Turkey 1,229; Belgium-Luxembourg 667.
Bromine	5,026	4,629	1,184	Israel 3,360.
Cement	188,074	281,770	346	Ireland 168,196; Netherlands 55,180.
Chalk	801	4,559	3	France 4,045; West Germany 372.
Clays, crude: Unspecified	160,663	167,316	55,205	France 43,740; Republic of South Africa 21,005; Greece 16,097.
Cryolite and chiolite	1,651	481	--	All from Denmark.
Diamond:				
Gem, not set or strung value, thousands	$1,872,139	$1,658,735	$76,022	Switzerland $1,104,976; Belgium-Luxembourg $320,429.
Industrial do	$53,185	$41,239	NA	NA.
Diatomite and other infusorial earth	12,296	14,352	3,414	Denmark 8,348; France 1,734.
Feldspar, fluorspar, related materials	118,604	129,874	11	Norway 69,780; Finland 29,276.
Fertilizer materials:				
Crude, n.e.s	1,204	1,522	18	Ireland 1,225; France 192.
Manufactured:				
Nitrogenous	327,066	506,657	84	Netherlands 193,878; Belgium-Luxembourg 127,881.
Phosphatic	81,336	118,278	1	Netherlands 30,947; Belgium-Luxembourg 26,125.
Potassic	479,784	495,693	77	East Germany 234,930; West Germany 124,647.
Unspecified and mixed	407,770	435,731	20,074	Netherlands 100,577; Belgium-Luxembourg 79,551; Denmark 54,786.
Graphite, natural	15,529	17,862	562	Madagascar 5,706; China 4,980.
Gypsum and plaster	48,596	78,115	237	Ireland 42,717; France 30,698.
Iodine	1,358	1,471	16	Japan 898; Chile 507.
Lime	1,029	2,629	38	Ireland 1,994; France 276.
Magnesium compounds:				
Magnesite	8,499	27,040	73	Greece 14,798; Ireland 2,107.
Oxides and hydroxides	13,889	4,328	136	Ireland 1,684; Japan 332.
Other	^{r}73,321	56,459	75	Spain 28,496; China 12,405.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Mica:				
Crude including splittings and waste	13,895	14,073	50	China 8,513; France 1,665.
Worked including agglomerated splittings	456	480	125	Belgium-Luxembourg 110; West Germany 90.
Nitrates, crude	6,923	5,774	--	Belgium-Luxembourg 2,989; Chile 2,785.
Phosphates, crude thousand tons	1,456	1,312	52	Morocco 794; Senegal 330.
Pigments, mineral:				
Natural, crude	1,547	1,647	--	Cyprus 876; West Germany 76.
Iron oxides and hydroxides, processed	20,014	23,391	885	West Germany 18,734.
Potassium salts, crude	25,011	22,492	--	West Germany 13,430; East Germany 9,062.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$172,646	$117,304	$19,172	Switzerland $67,262; West Germany $8,289.
Synthetic do.	$1,241	$870	$667	Belgium-Luxembourg $64; Switzerland $53.
Pyrite, unroasted	--	15,690	NA	NA.
Salt and brine	97,923	183,607	299	Italy 90,245; Ireland 23,263.
Sodium compounds, n.e.s.: Carbonate, manufactured	70,892	120,481	100,050	U.S.S.R. 3,926; Bulgaria 3,787.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	26,345	25,668	101	Italy 7,662; Finland 3,092.
Worked	40,299	40,164	186	Italy 19,558; Portugal 10,006.
Dolomite, chiefly refractory-grade	88,312	99,788	5,869	Spain 67,829; Norway 23,804.
Gravel and crushed rock	571,609	709,444	30	France 295,514; Ireland 197,726.
Limestone other than dimension	2,735	2,137	--	France 1,914; Ireland 96.
Quartz and quartzite	3,876	7,757	149	West Germany 4,386; Netherlands 561.
Sand other than metal-bearing	56,095	61,611	676	Belgium-Luxembourg 49,133.
Sulfur:				
Elemental:				
Crude including native and byproduct	899,291	849,549	255	Poland 308,254; France 213,709; Belgium-Luxembourg 104,591.
Colloidal, precipitated, sublimed	636	842	26	West Germany 419; France 373.
Sulfuric acid	38,476	--		
Talc, steatite, soapstone, pyrophyllite	55,845	58,508	434	Norway 17,424; France 7,866.
Vermiculite	151,751	121,605	NA	NA.
Other:				
Crude	261,908	241,585	5,261	Netherlands 76,852; Norway 51,216.
Slag and dross, not metal-bearing	97,614	105,504	357	France 33,818; Netherlands 33,058.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	12,277	12,412	2,926	Trinidad and Tobago 4,215; France 3,249.
Carbon: Carbon black	65,880	79,909	NA	France 11,249; Norway 6,905.
Coal:				
Anthracite thousand tons	^{r}330	617	103	West Germany 306; Republic of South Africa 63.
Bituminous do.	^{r}3,961	3,445	1,886	Australia 1,132; Poland 319.
Briquets of anthracite and bituminous coal do.	132	89	--	West Germany 55; France 22.
Coke and semicoke do.	28	451	--	Japan 397; Belgium-Luxembourg 17.
Gas, natural million cubic feet	400,785	381,065	NA	Norway 381,047.
Peat including briquets and litter	135,521	144,858	13	Ireland 130,847; U.S.S.R. 8,666.
Petroleum:				
Crude thousand 42-gallon barrels	241,149	206,808	--	Saudi Arabia 61,289; Norway 22,886; Egypt 18,575.
Refinery products:				
Liquefied petroleum gas do.	^{r}7,330	5,586	102	Saudi Arabia 1,633; Netherlands 1,465.
Gasoline:				
Aviation do.	21,707	7,205	NA	Netherlands 2,553; Italy 2,526.
Motor do.	26,941	22,726	258	Netherlands 5,480; Algeria 5,102.
Mineral jelly and wax do.	206	194	4	Netherlands 89; Brazil 32.
Kerosine and jet fuel do.	6,197	5,769	196	Netherlands 2,119; Italy 1,072.
Distillate fuel oil do.	10,224	12,751	26	U.S.S.R. 5,472; Netherlands 2,846.
Lubricants do.	10,581	7,571	302	Belgium-Luxembourg 2,538; Netherlands Antilles 1,264.
Residual fuel oil do.	29,793	61,545	3,963	Netherlands 17,316; Belgium-Luxembourg 5,002.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Bitumen and other residues thousand 42-gallon barrels	376	584	(2)	Belgium-Luxembourg 316; Netherlands 211.
Bituminous mixtures do	40	72	5	France 27; Netherlands 14.
Petroleum coke do	1,687	1,736	843	Netherlands 594; Belgium-Luxembourg 201.

[r] Revised. NA Not available.

[1] Table prepared by Jozef Plachy.

[2] Less than 1/2 unit.

[3] May include other precious metals.

[4] Excludes quantity valued at $46,045,497.

COMMODITY REVIEW

METALS

Aluminum.—After completion of the merger between Alcan Aluminum (United Kingdom) Ltd. and The British Aluminium Co. Ltd. (BACO) in December 1982, operating costs were cut by about $61 million per year, and the combined company, British Alcan Aluminium, reported a net profit for the first 6 months of the year of $2.3 million. This compared with Alcan United Kingdom's first half loss of $21.3 million in 1982 and a loss for the whole year of $46 million. The cutbacks included the closure of two cold-rolling mills, one hot-rolling mill, and the foundry at the old BACO plant in Falkirk; closure of the foil plants at Kitts Green and Wembley; transfer of some of the Wembley plant to Scotland; and closure of the Skelmersdale extrusion plant, together with cutbacks in the distribution network.

Because of a rise in aluminum prices, the reopening of the Invergordon aluminum smelter in Scotland was under consideration, although a decision was said to be a long way off. The smelter was closed down in 1981 with the loss of 900 jobs.

Anglesey Aluminium Ltd., which is a joint venture between The Rio Tinto Zinc Corp. Ltd. (RTZ) and Kaiser Aluminium (UK) Ltd., was to modernize its Holyhead smelter in Wales, at a cost of $10 to $15 million. The plan, which needs parent-company approval, would introduce a large type of anode into the electrolysis of alumina into aluminum metal, thereby saving energy and increasing efficiency.

Gold.—The Birmingham-based bullion dealer, smelter, and refiner, John Betts Refiners Ltd., part of the W. Canning Group, made a $765,000 investment in a new gold refinery at its Oldbury plant near West Bromwich. The company planned to refine gold waste from the electronic, dental, and jewelry industries and to recover gold from the byproducts of its smelting processes.

The Carnarvon Mining Co. completed the first stage of its bulk sampling program at the Clogau St. Davids gold mine in North Wales. Samples from the dumps of waste rock left by previous operators of the mine assayed from 0.7 gram to 5 grams per ton. The mine was also under renovation. A shaft was being sunk below the old workings, and samples were taken to be assessed at AMAX Inc.'s Hemerdon property in Devon.

Iron and Steel.—The British Steel Corp. (BSC) suffered a loss of $591 million in the financial year 1982-83, compared with a loss of $519 million in the 1981-82 year. The production level of 11.7 million tons for the year was 19% below the level forecast in the corporate plan and was the lowest in many years. BSC estimated its raw steel output in 1983-84 would be 12.6 million tons, cutting the loss to $277 million. BSC's continuation of steelmaking at the five major BSC integrated plants remained Government policy. Home market deliveries in 1982-83 fell to 6.8 million tons, compared with 8 million tons in the 1981-82 year. Exports decreased from 2.7 million tons in the 1981-82 year to

2.5 million tons in 1982-83. As a part of a campaign to reduce costs of steel production, the policy was to change to cheaper fuels, relying more on coal and less on oil and gas.

The United Kingdom's Government approved BSC's plan and set an external financing limit for 1983-84 of $497 million and specifically approved the major project at Port Talbot on the basis that, as agreed with BSC, it should at this stage include one new reheating furnace. The plan put forward by the Chairman of BSC proposed capital spending amounting to $1,017 million over the 3-year period 1983-84 to 1985-86, of which $393 million worth of major schemes were due to start in 1983. These included $262 million for the modernization of the Port Talbot hot-strip mill, $55 million for the provision of a continuous-casting plant for medium-range seamless tubes at Clydesdale, $20 million for the renovation of the large-diameter seamless tube plant at Bromford, and $20 million for a new slab reheating furnace at the Lackenby beam mill.

BSC won a $28 million contract from Shell Ltd. to supply 40,000 tons of steel pipe for a pipeline to bring gas onshore in Scotland from Shell's North Sea Fulmar Oilfield. BSC also won a contract worth about $15.3 million to supply high-strength steel plate for use in a production platform for the Clyde Field, some 180 miles southeast of Aberdeen. Steel for the order will be made at BSC's Ravenscraig and Scunthorpe works and rolled into plate at the Scunthorpe and Dalzell plate mills. Delivery of the plates started in October.

Lead and Zinc.—AM&S Europe Ltd. succeeded in its efforts to save the United Kingdom's Avonmouth zinc smelter from closure. Productivity was reported to have improved because of a reduction in work force from 700 to 300, and costs at Avonmouth were also reduced by a change in the type of zinc and lead concentrate feed; the smelter was operating on a profitable basis. A series of financial losses over recent years had led to the smelter being regarded as a candidate for closure under the zinc smelter closure plan approved by the Commission of the EEC.

Nickel.—A further 97 jobs were to be cut at Inco Europe Ltd.'s Clydach, Wales, nickel refinery over a 10-month period, with 26 going by yearend and the rest by August 1984. This latest reduction in employment levels will bring the work force at the refinery to 574, almost one-half the 1,022 employed in 1980. In addition to the job cuts, other measures were taken to improve the plant's efficiency, including the installation of a new $700,000 residue handling facility, which will be commissioned in 1984. A plan to modernize facilities for the production of nickel chemicals was also under consideration.

Tin.—Production at 4,208 tons in 1982 was the highest for 66 years and represented about 40% of the United Kingdom's needs. South Crofty PLC, which operated the South Crofty and Pendarves Mines near Camborne, Cornwall, treated 253,059 tons of ore from the South Crofty Mine and 29,932 tons of ore from Pendarves. The latter figure included 2,500 tons of dump material. The company is Cornwall's largest tin producer. The modifications to the mill circuit were commissioned in March and mill operations were put on a seven day a week basis. At South Crofty, ore reserves were estimated at 870,000 tons, and at Pendarves, ore reserves were estimated at 77,000 tons. In August 1982, South Crofty became a subsidiary of Charter Consolidated Ltd., which took a 60% interest. RTZ held 40%. In January 1983, a rockfall in the main mine shaft caused major damage to the shaft, drastically reducing production for several weeks while repairs took place. In the first half of 1983, the mine lost some $1.1 million as a result of the accident.

Great Western Ore Ltd., a subsidiary of South Crofty, applied for planning permission to carry out surface exploratory drilling in an area 600 to 800 meters to the north of Pendarves. The company planned to drill six holes to depths of 250 to 400 meters to investigate the possible western extension of the Stray Park and Dolcoath lodes.

Geevor Tin Mines Ltd. in Cornwall turned a loss of $373,320 in the first half of 1983 into a second half pretax profit of $920,000. The profitability was tied to the high price of tin; it averaged $13,162 per ton in the latest period, well above Geevor's breakeven level of $12,240 per ton. The United Kingdom was not affected by production quotas imposed by the International Tin Council because as it was not exporting tin. Geevor made the most of this, maintaining production at full capacity and maximizing mining grades. In the year ending March 31, Geevor produced 879 tons of tin in concentrate, up from 842 in the previous 12 months, with the increase attributed to the treatment of greater amounts of dump material. The company was installing new concentrating equipment at its minesite in Cornwall, which was expected to increase capacity by 25% to 250,000 tons of ore per year. The company has received a grant of $536,000 from the Department of Trade and Industry toward the total cost of $3.4 million for the deepening of the subincline shaft at the mine to give access to lower levels. Work will begin in early 1984. A total of 341 persons were employed in 1982.

Carnon Consolidated Tin Mines Ltd., which operated the Wheal Jane tin mine near Truro and was a subsidiary of RTZ, treated 289,000 tons of ore yielding 1,664 tons of tin concentrate for 1982 and produced 10,190 tons of zinc and 636 tons of copper the second year of full production since operations were resumed. A marginal increase in production was a result of optimizing mill throughput and improving metallurgical efficiency. There were three major developments during the year: (1) The Clemows rock-hoisting shaft was completed and commissioned in the final quarter and by yearend was producing at full capacity; (2) The underground development on the 600 level west intersected a new ore body that gave encouragement for major ore reserve extensions in the west; and (3) The company purchased the net assets of Billiton (United Kingdom) Ltd. in September. These assets included 1.6 million tons of low-grade ore reserves, 160 acres of freehold, two treatment plants, and a major tailings disposal area. In the beginning of 1983, Carnon had 388 employees. In August 1983, at the Wheal Jane Mine, a Diamec 260 all-hydraulic core drill, operated underground, completed a 514-meter (1,686-foot) drill hole. This was claimed to be a record hole length for Cornish tin exploration underground.

Wheal Concord Ltd., a Cornish tin mine reopened in 1980, went into receivership in mid-March of 1982 apparently as a result of declining ore grades that made the mine's ore unacceptable to the Wheal Jane concentrator. Wheal Concord produced 21,000 tons of ore between 1980 and November 1982. Wheal Concord was reported to be interested in raising funds to erect its own mill.

Redmoor Prospect.—Further drilling at the Redmoor Prospect of Southwest Consolidated Resources PLC showed the grades of tin and tungsten within the vein structure to be higher than originally thought. Ore reserves were estimated at 44 million tons with an additional 800,000 tons in rich, narrow lodes that will enhance the average head grade.

Medway Tin Ltd.—The company was formed on April 16, 1982, with the objective of acquiring the assets at the Brea plant belonging to Whear (Transport and Ballast) Ltd. and refurbishing them with a view to operating the plant to produce tin from old mine waste material. Government assistance was received in the form of a Regional Selective Assistance Grant and a guaranteed bank loan under the Small Firms Guaranteed Loan Scheme. Work started on the site on April 20, 1983, and the first production test runs were carried out by the end of June. Full production started on September 7, and operations were continuous for the rest of the year. Total production of tin in concentrate was 32 tons.

RTZ Metals Ltd. was formed to replace RTZ Bristol Ltd. from December 1, 1983. It will hold and manage RTZ's directly owned exploration, mining, and metallurgical operations in the United Kingdom, Europe, and the Middle East. The new company's major subsidiaries in the United Kingdom are Capper Pass Ltd., Carnon, Imperial Smelting Ltd., RTZ Aluminium Ltd., Anglesey, and a few others.

Plans for a $4.6 million investment in a new offshore tin mining industry will go ahead if, as expected, the Crown Estates Commissioners issue a license for the operation to a mining company based at Redruth, Cornwall. The company, Marine Mining (Cornwall) Ltd., which is independent but largely financed by U.S. investors, intends to use new technology to pump seabed deposits through a pipeline to a processing plant on the shore of St. Ives Bay. Seabed deposits were expected to yield 925 tons of metal per year, representing 20% of the year's tin production in Cornwall.

Tungsten.—Billiton, a subsidiary of the Royal Dutch/Shell Group, extended to the end of 1984 its option to purchase a 50% stake of the Hemerdon Ball tungsten-tin property near Plymouth, United Kingdom, from Hemerdon Mining and Smelting Ltd. Billiton paid the $1 million required under the terms of the original agreement and will be obliged to pay a further $14 million if it decides to exercise the option. The other 50% of the Hemerdon property is owned by AMAX.

Hemerdon was the largest known tungsten deposit in the United Kingdom. Mineralization at Hemerdon was largely contained within a dike-like body of granite approximately 650 meters long, 150 meters wide, and 200 meters deep. Extensive drilling established a resource of 56 million tons averaging 0.16% WO_3 and 0.025% tin. Following the submission of a planning application to develop a 2.5-million-ton-per-year open pit and concentrator complex at the Hemerdon tungsten-tin site in late 1981, the Department of the Environment called a public inquiry into the application that lasted for 7 weeks during September and October 1982. The inquiry was held in Plymouth.

NONMETALS

Cement.—The United Kingdom's largest cement manufacturer, Blue Circle Industries PLC, made a profit of $88.9 million in 6 months, from January to June 1983, compared with $85.4 million profit in 1982 for the same period. Turnover in the first 6 months of 1983 was $625 million, and in 1982 for the same period was $575 million.

Blue Circle recently announced plans to build a new 650,000-ton-per-year cement-making plant on the site of its existing works at Shipton-on-Cherwell, Oxfordshire. The new plant is to be the most advanced of its kind in the United Kingdom and is expected to achieve higher standards in operating efficiency, design, and environmental control than any existing works.

Blue Circle Leasing Ltd. was carrying out a $44.4 million modernization program at Blue Circle's Couldon cement works, Waterhouse near Stoke on Trent. Henry Boot Civil Engineering Ltd. started work on part of the program with a contract valued at $5.7 million. The contract is expected to last for 65 weeks and will involve the construction of three 5,000-ton cement silos.

Fluorspar.—Aberdeen Barytes Co. Ltd. (Dresser Minerals) shut down fluorspar producing operations at the 80,000-ton-per-year acidspar flotation plant at Ryder Point near Wirksworth in Derbyshire. The company ceased flotation of fluorspar concentrates on June 8 and started land restoration work that was required by the local planning authorities. The disappearance of Dresser Minerals from the United Kingdom fluorspar industry provided a further step in a rapidly evolving industry in which Laporte Industries Ltd. appeared to be the sole stable representative.

Laporte Industries, with mines in Derbyshire, was the largest producer of fluorspar. All fluorspar was sold in the home market. Ore was obtained from three sources: underground mines, company controlled surface dump operations and open pits, and independent producers (tributers). In 1982, of the total production of CaF_2 milled, 37% was drawn from mines; 25%, from company dumps and open pits; and 38%, from free tributers. The company's Cavendish Mill near Stoney Middleton in Derbyshire operated on a 5-day week, producing some 70,000 tons per year of acid-grade fluorspar, 12,000 tons per year of filler-grade barite, 2,300 tons per year of lead concentrate and 130,000 tons per year of limestone.

Gypsum.—The United Kingdom's largest gypsum producer was British Gypsum Ltd. Production levels dropped slightly in the 1982-83 year, reflecting the general slowdown in the construction industry. Less than 1% of production was exported. British Gypsum had three quarries, with a fourth expected to come on-stream in the near future, and nine deep mines. All of British Gypsum's mines employed conventional room-and-pillar mining techniques and extracted seam heights varying between 1.8 and 9 meters. The rate of extraction ranged from 56% to 79%, depending on mine depth and seam strength characteristics.

Potash.—Cleveland Potash Ltd. (CPL), which operated the United Kingdom's only potash mine, at Boulby in the northeast of England, produced about 1.7 million tons of ore. In the first 6 months of the year, the company achieved its first trading profit. Marketing efforts were successfully increased, and an important factor was the mine's recent ability to offer specific potash grades and sizes to its customer. Ore was mined both from under the land and under the sea at depths of between 1,100 and 1,200 meters. Special room-and-pillar mining methods were used to produce ore. The surface installations were located on an 80-acre site and included shafts, an ore treatment plant, and a rail loading facility. Most of the potash was sent by rail to Teesdock where CPL had storage and port facilities. Since 1981, the mine has also become a substantial producer of salt, most of which was used by local authorities.

Salt.—There were the following four producers of white salt in the United Kingdom, all located in Cheshire: Imperial Chemical Industries Ltd. (ICI), British Salt Ltd., Ingram and Thompson and Sons Ltd., and the New Cheshire Salt Works Ltd., at Wincham. ICI and British Salt had a combined white salt market share of about 95% of the total. ICI's rock salt capacity was 1.8 million tons per year, and its potential white salt production was 1.3 million tons per year. The company's white salt operations were based at Western Point in Cheshire where the salt was extracted from brine cavities at a modern vacuum evaporation plant. British Salt, owned by Stavely Industries Ltd., had its vacuum salt operations at Middlewich. The capacity at the Middlewich plant was 825,000 tons per year, and brine salt contained 311 grams per liter of salt. Production of salt in brine, used for purposes other than saltmaking, was nearly 3.9 million tons.

MINERAL FUELS

Total primary energy consumption from fossil fuels and hydroelectric and nuclear generation in the United Kingdom was 312 million tons of standard coal equivalent, including coal, 112 million tons; petroleum, 106 million tons; gas, 74 million tons; nuclear energy, 18 million tons; and hydroelectric energy, 2 million tons.

The United Kingdom used approximately the same amount of energy as in 1982. However, consumption of gas and nuclear energy slightly increased and consumption of petroleum decreased compared with those of 1982.

Coal.—The United Kingdom's economically recoverable coal reserves were estimated at 45 billion tons, equal to over 300 years of consumption at current rates. Virtually all coal reserves were owned and exploited by NCB.

Total Government grants to NCB were $796 million in the 1982-83 year, including Government deficit grants, coke stocking aids, social costs, and others. Government grants to NCB were expected to be $965 million in the 1983-84 year. The NCB was following a major program of capital investment to improve existing mines and to open new, efficient ones. Capital spending in 1982-83 was $1.1 billion.

Two mines, Cardowan in Scotland and Brynlliw in South Wales, were slated to close. Brynlliw Mine suffered heavy losses, $38 million in the last 5 years, and it was projected to lose $9.9 million in the 1983-84 year, a loss of $80 per ton.

A second coal face was commissioned at the NCB's new Wistow coal mine at Selby, Yorkshire, despite the problems encountered at the first face. No production was possible at the first face after October 1983 when operations were halted because of flooding. The second face reached an output of 4,000 tons per day and had a capacity of 5,000 tons per day. Wistow was developed from an open field to the biggest coal mine in the United Kingdom in a little over 8 years. Total cost of the Selby development was estimated at more than $1.5 billion, and with Wistow, the project was halfway to completion. By 1987, it was estimated, the development cost will have been recouped. The most advanced equipment and techniques were applied to development and operation. A contract worth $8.7 million for the next phase of the two underground tunnels in the Selby Coalfield was awarded by the NCB to Amalgamated Construction Co. Ltd. of Barnsley. This phase will take the South tunnel from its present length of almost 6.5 kilometers to its completion length of 15 kilometers.

Natural Gas.—Indigenous natural gas production accounted for about 78% of total natural gas supplies; the remainder came from Norway and Algeria. Production came mainly from the Leman Bank, Indefatigable, Rough, Hewett, Viking, Frigg, and West Sole Fields. In addition, a growing amount of gas produced in association with oil in oilfields was brought onshore, particularly from the Piper Field. The British Gas Corp. (BGC) was undertaking a major investment program to develop the Morecambe Field in the Irish Sea and expected the first supplies to be brought onshore in 1984.

Total proven and probable gas reserves remaining in known discoveries in the United Kingdom's Continental Shelf amounted to 33,236 billion cubic feet at the end of 1982.

Gas gathering systems for bringing onshore associated gas from the northern North Sea oilfields made good progress. The Far North Liquid and Associated Gas System (FLAGS) together with its Western Leg came on-stream in May 1982 by bringing onshore associated gas from the Brent, North and South Cormorant, and Ninian Fields. In addition, the delivery of associated gas from Murchison commenced in the summer of 1983 via the Northern Leg of FLAGS. There also were plans to lay a pipeline to take gas from the Fulmar Field to St. Fergus in Scotland. During the year ending March 31, 1983, BGC's operating profits amounted to $1.0 billion on turnover of $9.2 billion.

Work on conversion of the partially depleted Rough Gasfield into a seasonal storage facility was continuing. The Secretary of State for Energy gave formal approval of the plans for this project in July. Good progress was made on the construction of extra storage facilities for liquefied natural gas. It was also planned to increase the number of salt cavity storage areas from six to seven. Three cavities were completed, and two more were under construction. The measures taken in the Oil and Gas (Enterprise) Act of 1982 increased the competitive pressures under which BGS was operating. A wider market was created for the sale and purchase of gas, and the Government expected this to contribute to a more efficient development of British resources. During 1982, 17 exploration and appraisal wells were started in the southern North Sea, compared with only 2 in the previous 4 years. The eighth round of licensing on the United Kingdom's Continental Shelf was completed and will give a further acceleration to gas exploration; 24 of the 70 blocks licensed in the round were in the already-proven area of the southern North Sea.

Petroleum.—The British National Oil Corp. (BNOC) was a public corporation set up under the Petroleum and Submarine Pipelines Act of 1975 as a producer and a major oil trader. On August 1, 1982, under the Oil and Gas (Enterprise) Act of 1982, BNOC's oil-producing business was transferred to a new company, Britol Ltd., which became an independent private sector company by a public sale of shares. In 1983, BNOC continued in existence, wholly within the public sector, as an oil trader with rights through agreements with other oil companies to purchase up to 51% of oil currently produced, and as an agent for the Government in marketing oil received as royalty for payments in kind. BNOC will thus remain the largest single trader in oil from the United Kingdom's Continental Shelf.

The United Kingdom was self-sufficient in petroleum production, reaching a rate of 2.3 million barrels per day. January production was expected to be about 2.7 million barrels per day as output built from the four new fields that went on-stream during the summer. The new fields will help replace production declines in a number of older fields, notably British Petroleum Co. PLC's Forties Field. Forties was due to decrease to a 380,000-barrel-per-day average for 1984 from a 454,000-barrel-per-day average during 1983. Crude oil production by fields was as follows:

Field	Operator	Approximate production rate (barrels per day)
Argyll	Hamilton Bros	20,000
Auk	Shell-ESSO	12,000
Beatrice	British National Oil Corp.	32,000
Beryl	Mobil	89,000
Brent	Shell-ESSO	312,000
Buchan	British Petroleum	28,000
Claymore	Occidental Petroleum.	97,000
Cormorant, North	Shell-ESSO	28,000
Cormorant, South	do	18,000
Dunlin	Shell-Exxon	79,000
Forties	British Petroleum	448,000
Fulmar	Shell-ESSO	53,000
Heather	Unocal Exploration	34,000
Montrose	Amoco	18,000
Murchison	Conoco (80% in British sector).	[1]89,000
Ninian	Chevron	[1]304,000
Piper	Occidental	199,000
Tartan	Texaco	12,000
Thistle	British National Oil Corp.	[1]122,000

[1] Peak.

First of the new British producing fields, Northwest Hutton, was placed in production by Amoco (United Kingdom) Exploration Ltd. in April. It is expected to reach peak production of 100,000 barrels per day and 35 million cubic feet per day of gas by yearend. Production moved through the Brent oil pipeline system and the western leg of Shell-ESSO's FLAGS gas gathering system from Brent to the Scottish mainland.

The United Kingdom North Sea petroleum tax and duty regime was fundamentally relaxed to encourage more exploration and development programs. Already companies operating in the United Kingdom North Sea sector were reappraising known fields where development was not previously considered economically viable.

Oil and gas exploration in the British North Sea increased to a record 128 wells drilled. Some 21 new oil and gas discoveries were made. After March, the Government approved applications for the development of nine new oil and gas fields. In the year before March, it had agreed to only three applications for development.

In 1982, the remaining recoverable proven reserves of oil in the United Kingdom's Continental Shelf amounted to about 11 billion barrels, and total recoverable reserves, proven plus possible, were estimated at 14 billion barrels. Onshore production of crude oil in the United Kingdom was much less significant than offshore production. The United Kingdom's largest onshore field at Wytch Farm (Dorset), which started production in 1979, was producing about 2,800 barrels per day.

Other onshore fields in operation included Bothamsall and Egmanton in Nottinghamshire, Gainsborough in Lincolnshire, and Kimmeridge in Dorset.

Capacity of the United Kingdom's oil refineries was 2.5 million barrels per day at the beginning of 1982. All but 4 of the 18 refineries in operation in September 1982 had a distillation capacity of over 100,000 barrels per day; 2 refineries had a crude distillation capacity of over 200,000 barrels per day.

Uranium.—Britain was to cut its uranium stockpile by one-half by 1990 according to the British Civil Uranium Procurement Organization chief. At present, a 4-year supply of uranium is stockpiled in the United Kingdom. The move will coincide with the ending of a contract for uranium from the Rossing Mine in Namibia. Britain will then be supplied solely by Canada.

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[1] Foreign mineral specialist, Division of Foreign Data.

[2] Central Statistical Office (London). Annual Abstract of Statistics, 1984 Edition. P. 169.

[3] Where necessary, values have been converted from pounds sterling (£) to U.S. dollars at the rate of £1.00=US$1.53, the average rate during 1983.

The Mineral Industry of Venezuela

By H. Robert Ensminger[1]

The most important event for Venezuela's mineral industry was the favorable performance of the aluminum industry. Production increased substantially over that of 1982, and the new alumina-producing company, Interamericana de Alúmina C.A. (INTERALUMINA), unexpectedly showed a profit, despite an earlier projection of a $13.6 million[2] deficit. Iron ore exports also increased compared with those of 1982. Engineering agreements were signed to develop a bauxite deposit (Cerro Paez) to be opened in 1985 and produce 3 million tons annually. C.V.G. Ferrominera Orinoco C.A. announced plans to develop a new $40 million iron ore open pit project, which is expected to produce 6 million tons annually by 1985.

On the overall economic picture, Venezuela suffered possibly the most serious economic recession of the past 30 years. The severe downturn was reflected in a 4% decline in the economy. This negative effect was apparent in many segments of the mineral industry.

The major factor that affected the economy was the decreased petroleum export earnings. In 1983, Venezuela's petroleum export earnings declined approximately 17% from the 1982 figure, which in turn was down from that of 1981. The oil industry's expenditures for oil and gas exploration, production, etc., for 1983 were approximately $3.6 billion, which was somewhat below the figure for 1982.

According to C.V.G. Bauxita Venezolana C.A. (BAUXIVEN), the Los Pijiguaos bauxite mining project has slipped 5 years behind schedule. The delay was principally due to economic austerity moves.

PRODUCTION

Petroleum continued to be the major component of Venezuela's mineral production and contributed to approximately 95% of the total export earnings in 1983. Petroleum production was about 5% below the level for 1982. Venezuela was limited to production of 1.675 million barrels per day by the Organization of Petroleum Exporting Countries' 1983 agreement. Gross natural gas production increased approximately 3% above the 1982 figure. Petrochemical production for the year reached approximately 1.9 million tons.

The aluminum industry's production showed surprising strength compared with the other major segments of the country's mineral industry. The total aluminum production was 343,000 tons, which was 25% above the 1982 figure. Aluminio del Caroni S.A. (ALCASA) produced 113,000 tons of aluminum, up 17% from that of 1982. Industria Venezolana de Aluminio C.A. (VENALUM) produced 230,000 tons of aluminum, 35% above the 1982 figure. The infant alumina industry in its first year of operation produced 550,000 tons of alumina, which translated into a profit of approximately $5 million. Iron ore production was 9.715 million tons, down 13% from that of 1982. Steel production showed a decrease of 2% compared with the 1982 figure, while pig iron showed a decrease of 5%. The estimated diamond production was about the same as that for 1982.

Table 1.—Venezuela: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum, unalloyed ingot	227,444	327,900	313,523	[2]273,633	343,000
Gold, mine output, metal content troy ounces	14,989	[r]13,565	27,810	27,993	25,000
Iron and steel:					
Iron ore and concentrate thousand tons	15,260	16,103	15,553	11,200	9,715
Metal:					
Pig iron[3] do.	1,331	2,367	2,230	2,357	2,246
Ferroalloys:					
Ferromanganese do.	1	[e]2	[e]2	2	2
Ferrosilicomanganese do.	1	[e]2	[e]2	2	2
Ferrosilicon do.	35	47	[e]22	47	46
Total do.	37	51	[e]26	51	50
Steel ingots and castings do.	1,474	1,784	1,817	2,296	2,246
Semimanufactures, hot-rolled do.	1,224	1,398	1,400	1,795	1,923
Lead, secondary, smelter[e]	10,000	10,000	10,000	10,000	10,000
NONMETALS					
Cement, hydraulic thousand tons	3,979	4,843	[e]4,900	5,594	4,147
Clays:[4]					
Kaolin	21,528	[e]22,000	65,642	65,000	65,000
Other thousand tons	2,088	[e]2,000	2,629	2,600	2,600
Diamond:					
Gem carats	236,606	210,520	[r] [e]90,500	[r] [e]99,000	100,000
Industrial do.	566,040	455,336	[r][e]400,000	[r] [e]394,000	400,000
Total do.	802,646	665,856	[r] [e]490,500	[r] [e]493,000	500,000
Feldspar	88,902	6,065	21,684	7,000	7,000
Gypsum	260,141	117,476	218,234	159,000	175,000
Lime, hydrated	--	--	1,888	1,900	2,000
Nitrogen: N content of ammonia thousand tons	259	361	415	[2]440	281
Salt, all types	[e]155,000	243,145	[e]250,000	340,166	350,000
Stone, sand and gravel:[4]					
Stone:					
Broken stone and dust, not further described thousand tons	1,459	[e]1,500	7,962	7,900	8,000
Dolomite	NA	NA	254,540	182,000	180,000
Granite	367	208	1,256	1,200	1,200
Limestone thousand tons	19,872	19,074	31,690	5,760	6,000
Marble cubic meters	191	[e]200	292	4,089	4,000
Sand and gravel thousand tons	19,231	12,248	9,946	13,105	14,000
Sand do.	--	--	9,442	9,500	10,000
Sand, glass do.	--	--	442	500	500
Sulfur, byproduct of petroleum and natural gas	85,201	[e]85,000	[e]85,000	84,000	85,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[e] thousand tons	16	23	19	18	18
Coal, bituminous	55,377	39,421	45,735	43,100	43,100
Gas, natural:					
Gross million cubic feet	1,304,624	1,251,864	1,224,586	1,163,973	1,200,000
Marketable do.	575,556	589,046	584,349	527,000	559,200
Natural gas liquids:[5]					
Condensate thousand 42-gallon barrels	75	101	52	30	30
Natural gasoline do.	6,120	5,472	5,177	5,642	5,600
Liquefied petroleum gas do.	18,995	16,448	14,889	15,511	16,000
Total do.	25,190	22,021	20,118	21,183	21,630
Petroleum:					
Crude[6] do.	860,072	793,397	767,552	691,689	655,905
Refinery products:					
Gasoline:					
Aviation do.	271	276	284	328	300
Motor do.	54,102	57,557	59,578	62,694	62,000
Jet fuel do.	10,970	11,699	11,369	14,362	14,000
Kerosine do.	3,699	4,352	5,266	3,675	3,500
Distillate fuel oil do.	56,484	63,688	61,890	62,745	62,000
Residual fuel oil do.	202,306	168,906	147,117	140,052	140,000
Lubricants do.	3,163	3,277	2,741	2,481	2,400
Liquefied petroleum gas do.	2,241	2,537	1,765	1,955	2,000
Asphalt and bitumen do.	7,798	7,634	10,082	9,313	9,000
Naphtha do.	16,906	12,752	8,534	10,140	10,000

See footnotes at end of table.

Table 1.—Venezuela: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982[p]	1983[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum —Continued					
Refinery products —Continued					
Refinery gas[7] thousand 42-gallon barrels	6,692	6,497	8,518	8,578	8,500
Unspecified do	3,938	2,292	1,870	1,479	1,400
Total do	368,570	341,467	319,014	317,802	315,100

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through July 1, 1984.

[2] Reported figure.

[3] Total includes sponge iron.

[4] Data prior to 1981 was based on figures taken from the Memoria y Cuenta published annually by the Ministerio de Energia y Minas. Some of this information is not compatible with 1981 figures, but will be adjusted when more reliable data become available.

[5] From nonassociated natural gas only.

[6] Includes associated natural gas lease condensate and natural gasoline. Lease condensate is included as follows, in thousand 42-gallon barrels: 1979—1,803; 1980—1,227; 1981—1,661; 1982—1,771; and 1983—not available. Natural gasoline is included as follows, in thousand 42-gallon barrels, reported: 1979—255; 1980—308; 1981—307; 1982—293; and 1983—not available.

[7] Liquid equivalent.

TRADE

Petróleos de Venezuela S.A. (PDVSA) reported the value of exported crude petroleum and refined petroleum products after foreign exchange was $13 billion compared with $15.6 billion in 1982. In 1983, Venezuela exported approximately 56 million barrels of crude petroleum to the United States, comprising about 8.5% of Venezuela's total petroleum production.

The lapsed oil agreement between Venezuela and the U.S.S.R. was renewed. Under the agreement, Venezuela was to export 20,000 barrels of oil to Cuba while the U.S.S.R. was to export a like amount to a refinery jointly owned by PDVSA and Veba Oel AG in the Federal Republic of Germany.

Iron ore exports were 4.7% greater than in 1982; Siderúrgica del Orinoco C.A. (SIDOR) exported 781,000 tons of steel in 1983. Fior de Venezuela S.A. exported 348,300 tons of direct-reduced iron briquets from its plant in Ciudad Guayana during the year.

Aluminum exports increased approximately 24% over those of 1982. INTERALUMINA exported 132,000 tons of alumina, most of it going to Norway and the United States. The Aluminum Company of America (Alcoa) began supplying bauxite to INTERALUMINA. The agreement called for Alcoa to supply 1.2 million tons of bauxite over 3 years from operations in Brazil and Suriname.

COMMODITY REVIEW

METALS

Aluminum.—VENALUM showed a profit of $109 million on total sales of about $365 million in 1983, a sharp contrast to the large loss in 1982. By yearend, only 33 of the 250 pots damaged in 1981 remained inactive. ALCASA showed a profit of $18 million in 1983 compared with a loss of $43 million in 1982. Total sales were $173 million.

The Venezuelan aluminum industry benefited not only from the improvement in world demand and prices, but also from the country's new exchange rate system introduced in February, under which the aluminum companies received Bs6 per U.S. dollar for export receipts rather than Bs4.3.

From 1983 production and previously accumulated stocks, ALCASA sold 40,900 tons on the domestic market and 77,500 tons on the international market and VENALUM sold 12,000 tons domestically and 237,000 tons abroad. VENALUM exported the bulk of its production to five Japanese companies.

ALCASA reopened a 26,000-ton-per-year production line that closed in 1982, expanded capacity at its carbon plant from 5,500 to 9,500 tons per year, and completed a 2,500-meter-long transport belt to carry alumina from INTERALUMINA to ALCASA's Ciudad Guayana plant. The aluminum industry expects primary aluminum metal production to jump to 500,000 tons per year by 1987. The increase will mainly result from 100,000 tons of additional capacity planned for ALCASA.

Alumina.—In 1983, INTERALUMINA earned about $5 million. Total sales were about $105 million, of which debt servicing consumed $21.3 million of the total. The $5 million profit contrasted sharply with the original projection of Fondo de Inversiones (FIV), the state investment company, of a deficit of $13.6 million.

Bauxite.—BAUXIVEN and Ferrominera Orinoco signed an agreement to jointly perform basic detailed engineering for the Cerro Paez bauxite deposit in the Los Pijiguaos Project. The two companies will also examine alternatives to shipping the bauxite down the Orinoco River. The mine is expected to begin production in 1985 at a rate of 3 million tons per year.

Iron Ore.—Ferrominera Orinoco registered an estimated profit of $18 million in 1983, an increase of about $13 million over that of 1982. The increased profit follows the liquidation and transfer of unprofitable ventures including the 1981 shutdown of the high-iron briquet plant, which resulted in annual losses of $12 million.

Ferrominera Orinoco exported 3 million tons of iron ore to the United States Steel Corp. through an 11-year contract signed in 1982. Another 4.5 million tons was sold to European companies through medium-term contracts of up to 5 years' duration.

The company began an estimated $40 million project in 1983 to develop its high-quality San Isidro reserve by 1985. The open pit mine, with a proposed production capacity of 6 million tons per year, will allow Ferrominera Orinoco to reduce output at lower grade sites.

Iron and Steel.—Venezuela vowed to retaliate against any protectionist measures taken by the European Economic Community (EEC) based on the charges lodged in 1982 against the Venezuelan steel industry. The president of SIDOR stated that Venezuela would not accept any reduction in its exports to the EEC. Steel production in 1983 was approximately 2.25 million tons, slightly below the 1982 figure. SIDOR exported 781,000 tons of steel.

SIDOR reduced its losses 43% from the figure for 1982. The improved financial results were largely attributed to the exchange rate profits earned on export sales, as well as continued improvement in SIDOR's operating efficiency. One of the primary reasons why the steel industry lost money was the 40% drop in domestic sales compared with those in 1982. The decrease in domestic sales was the result of the severe domestic economic downturn, especially in construction and the automobile industry. In September, SIDOR produced a record high 204,000 tons, the first time ever that monthly steel output exceeded 200,000 tons.

Navales Venezolanos S.A. (ASTINAVE), the new Venezuelan shipbreaking and construction yard, was formally inaugurated in November. ASTINAVE is jointly owned by FIV and Spain's Astilleros Españoles S.A. The yard has the capacity to produce 100,000 tons of scrap per year and will engage in shipbuilding and repair.

Ferroalloys.—Ferrosilicio de Venezolana S.A., the state ferrosilicon company, registered a loss of about $4 million, an amount somewhat greater than the 1982 figure.

MINERAL FUELS

Coal.—The Paso Diablo Mine, located approximately 100 kilometers northwest of Maracaibo in the State of Zulia, is scheduled to begin coal production in 1987. The mine will be operated by Carbones del Zulia C.A., the state coal-producing company. The great preponderance of the production will be used to generate electricity at the new thermal-electric powerplant near Maracaibo. The mine region was found to contain proven reserves of 350 million tons with potential reserve estimates as high as 4 billion tons. The coal is of superior quality, running 12,000 to 13,000 British thermal units per pound with a low ash and sulfur content.

Petroleum and Natural Gas.—Venezuela's proven oil reserves for 1983 were 24.8 billion barrels, up 3.2 billion barrels from that of 1982. Crude oil production for the year was 656 million barrels. Daily production was 1.8 million barrels, approximately 7,000 barrels per day below the figure for 1982. The $8 billion project to develop the Orinoco heavy oil belt was delayed several years owing to severe economic problems. Other projects being delayed included the Maraven S.A. refinery at Cardón and the Meneven S.A. refinery at Puerto la Cruz. The total value of the postponed projects was approximately $10 billion. Approximately 80% of the industry's investments was allocated to maintain and increase production potential to 2.8 million barrels per day by 1988 compared with the current potential of 2.5 million barrels per day. Corpoven S.A., a subsidiary of PDVSA, reported an important high-gravity oil discovery in Lake Maracaibo in 1983. The area was accorded top priority by PDVSA as a prospective site of large light crude oil reserves. PDVSA let a $150 million contract to Dresser Industries Inc., Dallas, Texas, for 10 compressor packages. The packages will be installed on production platforms in Lake Maracaibo. Completion is set for 1985 with Venezuelan firms having major shares in management, engineering, and construction.

Venezuela's 1983 proven natural gas reserves were put at 1.53 trillion cubic meters, which was an increase of 200 billion cubic meters over the 1982 figure.

Corpoven proceeded with the Nurgas Project, a 780-kilometer gas pipeline. Corpoven planners estimated the industry could save 200,000 barrels of fuel oil per day by utilizing natural gas to fuel operations of several oil refineries such as Puerto la Cruz, El Palito, Cardón, and Amuay, and by substituting gas for fuel oil at the Tacoa and Planta Centro thermoelectric facilities. This savings in fuel oil translates into $1.46 billion in additional export revenue.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, unless otherwise specified, values have been converted from Venezuelan bolivars (Bs) to U.S. dollars at the rate of Bs4.3=US$1.00.

The Mineral Industry of Yugoslavia

By Roman V. Sondermayer[1]

The mineral industry of Yugoslavia faced difficulties in 1983. Shortages of energy and of foreign currency for spare parts slowed down exploration for and production of major mineral commodities. In particular, energy shortages affected electrolytic and ferroalloying plants. Lack of spare parts created difficulties in operation of opencast mines, drilling for oil and gas, and crude petroleum production.

By world standards the mineral industry remained modest. Production of alumina, antimony, bauxite, lead (mine), and magnesite contributed between 3% and 5% of the world totals, the highest shares among minerals produced in the country.

The mineral industry employed about 6.0% of the total labor force and its share in the gross social product was 7.5%. Details are shown in the following tabulation:

Branch	Production value (million dinars)	Employment (thousands)
Coal:		
Production	31,687	55.5
Processing	4,452	3.4
Crude oil:		
Production	22,014	4.2
Processing	15,043	9.7
Iron and steel:		
Iron ore production	1,944	4.6
Steel production	37,085	54.2
Nonferrous metals:		
Production of ores	15,035	27.4
Metal production	13,589	13.9
Metal processing	10,034	14.2
Nonmetallics:		
Production	5,538	12.1
Processing	22,092	51.5
Sand and gravel	8,516	25.4
Construction materials	30,766	74.4
Total	217,795	350.5

The major events in the mineral industry included the completion of a new lead and zinc mill at the Trepca Mine, development of the Sastavci-Krizevak lead and zinc mine, reopening of the Idrija mercury mine, commissioning of a new ferronickel plant at Glogovac, startup of a new lignite mine at Drmno, and a decision to start production and processing of oil shales in Serbia.

PRODUCTION

Production facilities in the mineral industry belong to the state. Private activities are prohibited. However, to acquire modern technology and get access to capital from abroad, investment of foreign capital is permitted with the stipulation that the domestic partner retains 51% ownership in the joint venture.

Mineral producing and processing companies operate at different technical levels. Aluminum, alumina, petroleum and copper-producing facilities are modern; but coal, lead, and zinc facilities are obsolete.

The largest enterprises of the mineral industry include, among others: Rudarsko Topionicarski Bazen Bor (RTB Bor) for copper; Energoinvest for bauxite, alumina, and aluminum; Zajaca, Rudarsko Topionicki Bazen for antimony; Titovi Rudnici Uglja for brown coal and lignite; and Industrija Nafte (INA) for petroleum.

Table 1.—Yugoslavia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS					
Aluminum:					
Bauxite thousand tons	3,012	3,138	3,249	3,668	[3]3,500
Alumina	836,428	1,058,366	1,037,227	1,017,056	1,015,000
Metal ingot:					
Primary	167,681	161,366	172,683	220,100	250,000
Remelted[4]	21,841	23,394	24,084	26,263	33,559
Total	189,522	184,760	196,767	246,363	[3]283,559
Antimony:					
Mine and concentrator output:					
Ore, gross weight	91,335	70,062	66,517	62,996	51,000
Metal content of ore	2,037	1,680	1,455	1,517	1,300
Concentrate, gross weight	4,480	3,809	3,413	3,690	3,000
Metal (regulus)	2,401	2,237	2,198	1,872	[3]895
Bismuth, smelter output	23	83	102	49	[3]45
Cadmium, smelter output	289	201	208	174	175
Chromium:					
Chromite ore (domestic production)	168	--	--	--	--
Chromite concentrate (produced largely from imported ores)	90,500	99,012	105,135	81,648	80,000
Copper:					
Mine and concentrator output:					
Ore, gross weight thousand tons	16,446	19,559	18,337	19,733	[3]23,443
Cu content of ores	111,421	114,786	110,961	119,299	140,000
Concentrate, gross weight thousand tons	478	496	478	514	600
Metal:					
Blister and anodes:					
Primary	108,732	93,745	92,505	94,013	135,000
Remelted[4]	71,250	78,617	86,175	86,865	95,000
Refined:					
Primary	99,224	91,755	90,660	82,456	91,000
Remelted[4]	38,280	39,533	41,943	44,414	32,708
Total	137,504	131,288	132,603	126,870	[3]123,708
Gold, refined troy ounces	138,987	106,226	115,164	135,387	120,000
Iron and steel:					
Iron ore:					
Gross weight thousand tons	4,617	[r]4,478	4,794	5,106	[3]5,018
Fe content do.	1,619	1,413	1,510	1,680	1,600
Iron concentrate, gross weight do.	1,636	2,097	2,451	2,669	2,600
Metal:					
Pig iron do.	2,360	2,425	2,817	2,703	[3]2,845
Ferroalloys:					
Ferrochromium	65,622	68,564	69,194	50,591	62,000
Ferromanganese	45,591	33,738	51,126	38,895	39,000
Ferrosilicon	67,884	66,171	80,201	70,888	80,000
Silicon metal	31,598	30,094	28,358	29,818	35,000
Ferrosilicomanganese	28,786	33,097	28,600	20,286	25,000
Ferrosilicochromium	6,785	10,326	5,873	6,129	6,000
Other	3,521	630	1,072	3,997	4,000
Total	249,787	242,620	264,424	220,604	[3]251,000
Crude steel:					
From oxygen converters thousand tons	1,071	1,149	1,424	1,349	[3]1,598

See footnotes at end of table.

Table 1.—Yugoslavia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
METALS —Continued					
Iron and steel —Continued					
Metal —Continued					
Crude steel —Continued					
From Siemens-Martin furnaces thousand tons	1,476	1,459	1,504	1,464	[3]1,432
From electric furnaces do.	990	1,026	1,048	1,037	[3]1,105
Total do.	3,537	3,634	3,976	3,850	[3]4,135
Semimanufactures do.	4,140	4,244	4,780	4,513	[3]4,649
Lead:					
Mine and concentrator output:					
Ore, gross weight (lead-zinc ore) do.	4,115	4,284	4,365	4,252	[3]4,063
Pb content of ores	129,776	121,465	118,556	113,119	110,000
Concentrate, gross weight	168,971	158,191	155,791	148,210	145,000
Metal:					
Smelter:					
Primary	92,000	85,000	74,000	74,008	75,000
Secondary[5]	41,603	39,664	46,456	35,000	35,000
Total	133,603	124,664	120,456	109,008	110,000
Refined:					
Primary[6]	92,040	84,751	73,901	72,000	77,531
Secondary	19,000	17,000	12,500	10,248	20,000
Total	111,040	101,751	86,401	82,248	[3]97,531
Magnesium metal	--	--	3,859	4,216	4,000
Manganese ore:					
Gross weight	30,150	30,250	31,149	27,494	26,000
Mn content	10,552	10,624	10,872	9,819	9,000
Mercury 76-pound flasks	--	--	--	--	1,500
Nickel:					
Mine output:					
Ore, gross weight thousand tons	--	--	--	452	500
Metal content of ore[e]	(7)	(7)	[r]2,000	[r]4,000	3,000
Nickel content of ferronickel[e]	--	--	--	[r]1,500	1,500
Platinum-group metals:					
Palladium troy ounces	5,241	4,501	3,119	2,893	3,000
Platinum do.	675	418	482	418	420
Selenium metal, refined kilograms	46,257	45,140	35,600	42,323	40,000
Silver, refined including secondary thousand troy ounces	5,214	4,790	4,437	3,343	[3]3,987
Zinc:					
Zn content of lead and zinc ore	101,699	95,253	88,640	83,813	85,000
Concentrator output, gross weight	167,907	154,845	150,366	149,411	150,000
Smelter including secondary	98,906	84,537	96,370	86,767	[3]88,049
NONMETALS					
Asbestos, all kinds	10,041	12,106	13,591	11,657	10,500
Barite	46,073	47,818	44,179	32,114	30,000
Cement, hydraulic thousand tons	9,082	9,315	9,780	9,718	[3]9,592
Clays:					
Ceramic clay, crude	(8)	84,777	113,714	121,709	122,000
Fire clay:					
Crude	390,759	[r]342,748	374,671	337,073	640,000
Calcined	105,680	74,460	72,804	60,009	60,000
Kaolin	177,958	197,124	224,797	236,485	240,000
Feldspar, crude	56,160	57,710	53,240	42,265	43,000
Gypsum:					
Crude thousand tons	568	619	669	640	600
Calcined	119,041	132,982	123,194	108,498	105,000
Lime:					
Quicklime thousand tons	1,526	1,504	1,614	1,550	1,600
Hydrated do.	875	880	950	860	900
Magnesite:					
Crude	293,305	261,841	299,676	328,456	[3]304,000
Sintered	145,723	147,808	154,339	152,676	150,000
Caustic calcined	9,939	11,343	14,841	11,712	12,000
Mica, all grades	338	249	265	1,403	1,400
Nitrogen: N content of ammonia thousand tons	418	404	421	422	420
Pumice and related volcanic materials: Volcanic tuff	170,594	360,438	533,679	516,514	500,000

See footnotes at end of table.

Table 1.—Yugoslavia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
NONMETALS —Continued					
Quartz, quartzite, glass sand:					
Quartz and quartzite thousand tons	239	200	212	205	200
Glass sand do	1,923	2,100	2,424	2,418	2,200
Total do	2,162	2,300	2,636	2,623	2,400
Salt:					
Marine	20,500	22,081	36,185	37,980	NA
From brines	191,696	186,435	189,976	191,746	NA
Rock	137,441	168,921	192,579	198,500	NA
Total	349,637	377,437	418,740	428,226	[3]425,000
Sand and gravel excluding glass sand thousand cubic meters	22,645	27,029	26,589	24,912	25,000
Sodium compounds: Sodium carbonate	164,382	129,069	147,156	181,880	190,000
Stone excluding quartz and quartzite:					
Dimension:					
Crude:					
Ornamental thousand cubic meters	69	71	78	72	NA
Other do	5	2	1	12	NA
Partly worked facing thousand square meters	1,274	1,944	2,058	2,134	NA
Cobblestones, curbstones, other thousand cubic meters	10	27	38	29	NA
Dolomite thousand tons	673	668	928	930	NA
Limestone do	4,125	4,061	4,081	4,872	NA
Shale do	8,055	8,386	8,759	8,324	NA
Crushed and broken, n.e.s. thousand cubic meters	8,703	[e]9,000	4,562	4,872	NA
Milled marble and other do	8,813	18,239	18,420	NA	NA
Sulfur, pyrite, pyrrhotite:					
Pyrite, gross weight thousand tons	452	607	652	810	850
Pyrrhotite, gross weight do	-	22	29	32	33
Sulfur:					
Sulfur content of pyrite[9] do	190	252	274	340	357
Sulfur content of pyrrhotite[9] do	--	9	12	13	13
Byproduct:					
Of metallurgy[e] do	200	200	200	200	180
Of petroleum[e] do	5	5	4	4	3
Total[e] do	395	466	490	[r]557	553
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	23,261	26,232	23,945	24,670	25,000
Coal:					
Bituminous thousand tons	434	388	384	389	[3]392
Brown do	9,351	9,665	10,581	10,744	[3]11,303
Lignite do	32,329	36,949	41,279	43,545	[3]46,889
Total do	42,114	47,002	52,244	54,678	[3]58,584
Coke:					
Metallurgical do	2,161	2,285	2,349	2,427	NA
Breeze do	175	177	171	183	NA
Foundry do	151	166	174	170	NA
Total do	2,487	2,628	2,694	2,780	[3]3,440
Gas:					
Manufactured (excluding petroleum refinery gas):					
From coke plants million cubic feet	18,893	29,845	29,633	30,904	NA
From lignite gasification plants do	3,743	3,393	4,112	3,621	NA
From other gas generators do	388	--	--	--	--
Natural, gross production do	65,579	64,272	77,585	80,728	[3]73,816
Natural gas plant liquids:					
Natural gasoline and pentane thousand 42-gallon barrels	149	NA	NA	NA	NA
Propane and butane do	531	533	746	NA	NA
Total do	680	NA	NA	NA	NA

See footnotes at end of table.

Table 1.—Yugoslavia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1979	1980	1981	1982[p]	1983[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum:					
Crude:					
As reported thousand tons	4,143	4,229	4,375	4,340	[3]4,125
Converted thousand 42-gallon barrels	30,687	31,324	32,405	32,146	30,525
Refinery products:					
Gasoline do.	22,177	21,930	20,119	23,042	[3]22,283
Liquefied petroleum gas do.	2,898	2,888	2,818	2,939	NA
Jet fuel do.	2,695	2,736	2,480	2,433	NA
Kerosine do.	254	100	109	110	NA
Distillate fuel oil: Diesel do.	29,214	24,790	22,924	24,546	[3]25,856
Residual fuel oil do.	43,217	33,373	27,672	35,990	[3]36,203
Lubricants do.	2,898	3,325	3,352	3,045	[3]3,227
Paraffin do.	125	142	133	235	NA
White spirit do.	250	221	247	254	NA
Asphalt and bitumen do.	4,497	3,897	3,527	3,254	NA
Petroleum coke do.	300	237	370	326	NA
Other do.	--	2,458	11,257	2,278	NA
Total do.	108,525	96,097	95,008	98,452	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1] Table includes data available through June 10, 1984.

[2] In addition to the commodities listed, bentonite, common clay, diatomite, and germanium are also produced, and tellurium may be recovered as a copper refinery byproduct, but available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

[4] Includes an undetermined quantity of secondary raw material.

[5] Calculated as the difference between reported total and reported primary figure.

[6] Calculated as the difference between reported total and reported secondary figure.

[7] Revised to zero.

[8] Included with "Fire clay: Crude."

[9] Calculated from pyrite and pyrrhotite concentrate using 42% as average sulfur content.

TRADE

Yugoslavia had a negative trade balance in minerals. Foreign trade in minerals represented a significant part of total foreign trade. Imports of high-rank coal, crude oil, and products of the iron and steel industry comprised the bulk by value. Exports of alumina, bauxite, and ferroalloys accounted for most mineral exports. Trade in minerals with the United States was insignificant.

Table 2.—Yugoslavia: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1980	1981	Destinations, 1981	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	246,821	266,055	--	Canada 125,253; Romania 76,721; U.S.S.R. 64,057.
Oxides and hydroxides	653,424	633,127	--	U.S.S.R. 521,987; Poland 94,424.
Metal including alloys:				
Scrap	276	177	--	West Germany 91; France 86.
Unwrought	53,872	58,471	--	East Germany 34,025; Czechoslovakia 5,500; France 4,300.
Semimanufactures	57,395	48,210	8,617	Czechoslovakia 14,068; East Germany 5,372; West Germany 2,976.
Antimony: Metal including alloys, regulus	1,055	1,220	--	U.S.S.R. 820; Bulgaria 400.
Cadmium: Metal including alloys, all forms	105	35	--	Czechoslovakia 30; Hungary 4.
Chromium:				
Ore and concentrate	11,537	12,463	--	All to Czechoslovakia.
Oxides and hydroxides	4	10	--	All to West Germany.
Copper:				
Ore and concentrate	16,131	--		
Matte and speiss including cement copper	--	252	--	All to Bulgaria.
Sulfate	10,535	7,355	--	Italy 7,208; Tunisia 80; Netherlands 40.
Metal including alloys:				
Scrap	6,129	4,035	--	Italy 2,139; West Germany 1,088; Albania 366.
Unwrought	14,334	13,801	3,107	Italy 3,991; United Kingdom 3,257; East Germany 2,209.
Semimanufactures	34,685	36,211	4,122	Italy 6,645; U.S.S.R. 6,568; West Germany 5,275.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	(2)	29,194	--	All to Hungary.
Pyrite, roasted	74,168	109,597	--	Hungary 60,531; West Germany 35,550; Austria 13,516.
Metal:				
Scrap	44,833	59,229	--	Italy 54,387; West Germany 3,052.
Pig iron, cast iron, related materials	50,811	25,518	--	Hungary 17,166; Austria 3,036.
Ferroalloys:				
Ferrochromium	50,130	63,087	41,748	Italy 6,523; Austria 4,092.
Ferromanganese	8,049	21,304	11,725	Italy 3,873; Austria 1,931.
Ferrosilicomanganese	23,240	17,847	16,269	Italy 1,500; Albania 78.
Ferrosilicon	36,705	61,585	3,757	Italy 16,583; West Germany 9,665.
Silicon metal	20,437	22,932	5,151	U.S.S.R. 9,535; Poland 2,711.
Unspecified	2,434	1,157	800	Italy 357.
Steel, primary forms	21,406	23,967	--	Poland 15,938; Hungary 7,428.
Semimanufactures:				
Bars, rods, angles, shapes, sections	93,694	121,378	--	Romania 22,346; West Germany 18,734; Iraq 16,589.
Universals, plates, sheets	9,659	24,646	46	Bulgaria 4,926; Poland 4,897; West Germany 4,607.
Hoop and strip	8,598	12,679	--	Poland 7,256; Czechoslovakia 4,504; Bulgaria 543.
Rails and accessories	14,172	10,129	--	Romania 5,243; Albania 4,397.
Wire	5,530	8,572	--	Czechoslovakia 2,380; Poland 2,308.
Tubes, pipes, fittings	111,321	104,876	11,105	East Germany 20,108; Libya 9,437.
Castings and forgings, rough	4,986	6,785	--	Czechoslovakia 1,879; Austria 1,544.
Lead:				
Ore and concentrate	10,070	12,864	--	Turkey 7,395; Bulgaria 4,125.
Oxides	2	157	--	Italy 150; West Germany 4.
Metal including alloys:				
Unwrought	27,564	15,697	--	Czechoslovakia 7,895; U.S.S.R. 3,278; Austria 2,887.
Semimanufactures	1,476	169	--	Austria 124; Italy 45.
Magnesium: Metal including alloys:				
Scrap	3	34	--	All to West Germany.
Unwrought	1,843	2,818	51	West Germany 1,966; Poland 309.
Semimanufactures	86	169	--	Austria 124; Italy 45.
Manganese: Ore and concentrate, metallurgical-grade	--	1,274	--	All to Italy.
Mercury 76-pound flasks	--	2,901	2,900	NA.
Nickel:				
Matte and speiss	99	--		
Metal including alloys:				
Scrap	288	148	--	Switzerland 114; West Germany 24.
Unwrought	230	189	--	Italy 103; Austria 86.
Semimanufactures	80	12	--	West Germany 7; Italy 2.

See footnotes at end of table.

Table 2.—Yugoslavia: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1980	1981	Destinations, 1981	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals: Waste and sweepings value	$113,575	$158,302	--	All to West Germany.
Silver:				
Waste and sweepings do	$692,713	$253	--	Do.
Metal including alloys, unwrought and partly wrought thousand troy ounces	1,946	1,575	739	Czechoslovakia 482; West Germany 193; United Kingdom 129.
Tin: Metal including alloys:				
Unwrought	49	56	--	West Germany 33; Austria 16.
Semimanufactures	3	(2)	--	Mainly to U.S.S.R. and Czechoslovakia.
Titanium: Oxides	11,353	12,559	102	East Germany 10,865; Romania 1,340.
Tungsten: Metal including alloys, all forms	4	19	3	West Germany 14.
Zinc:				
Ore and concentrate	8,831	6,047	--	Bulgaria 5,518; Austria 529.
Oxides	193	2,217	--	Romania 1,045; Hungary 770.
Metal including alloys:				
Scrap	35	--		
Unwrought	19,565	21,901	1,501	Czechoslovakia 12,357; Hungary 5,801.
Semimanufactures	9,105	9,501	--	Czechoslovakia 6,322; Hungary 1,010.
Other:				
Ashes and residues	31,086	3,880	--	Italy 2,905; Austria 500.
Base metals including alloys, all forms	4	9	--	West Germany 8.
NONMETALS				
Abrasives, n.e.s.:				
Artificial: Corundum	15,486	11,747	--	Romania 3,839; Italy 2,191.
Grinding and polishing wheels and stones	2,820	1,776	13	Romania 321; West Germany 247.
Asbestos, crude	2,506	2,938	--	Albania 2,568; Iran 300.
Barite and witherite	19,077	16,200	--	All to Hungary.
Boron materials: Oxides and acids	214	2,207	--	West Germany 839; Switzerland 580.
Cement	406,746	766,469	1,670	Egypt 250,938; Libya 117,050.
Chalk	53	(2)	--	All to U.S.S.R. and Iraq.
Clays, crude:				
Bentonite	1,401	348	--	U.S.S.R. 283; Tunisia 45.
Fire clay	12,467	16,409	--	Italy 8,361; Greece 6,460.
Kaolin	6,587	--		
Unspecified	482	405	--	West Germany 369; Greece 30.
Cryolite and chiolite	10	5	--	All to Malta.
Feldspar	11,498	3,109	--	Hungary 1,800; Czechoslovakia 800.
Fertilizer materials: Manufactured:				
Ammonia	36	(2)	--	Mainly to Burma.
Nitrogenous	60,471	91,401	--	Turkey 53,458; West Germany 19,363.
Phosphatic	203,469	175,205	--	U.S.S.R. 84,859; Hungary 81,286.
Unspecified and mixed	429,090	245,774	--	Hungary 96,745; Italy 44,699.
Graphite, natural	23	4	--	All to West Germany.
Gypsum and plaster	3,827	436	--	Libya 420; U.S.S.R. 12.
Lime	72,158	70,835	--	Hungary 68,154; Iraq 1,139.
Magnesium compounds:				
Magnesite	102	50	--	All to Bulgaria.
Other	24,219	29,310	--	U.S.S.R. 20,607; Italy 4,812.
Pigments, mineral: Iron oxides and hydroxides, processed	1	16	--	Hungary 15.
Pyrite, unroasted	67,941	14,428	--	Bulgaria 12,271; West Germany 2,154.
Salt and brine	2,812	1,642	--	Hungary 1,604; Canada 36.
Sodium compounds, n.e.s.: Carbonate, manufactured	2,132	2,774	--	Italy 2,772.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	56,354	48,647	--	Italy 27,942; Czechoslovakia 11,497.
Worked	8,282	7,374	23	West Germany 2,250; Austria 2,232.
Gravel and crushed rock	8,553	5,224	--	Hungary 2,673; Italy 1,267.
Quartz and quartzite	12,124	10,002	--	West Germany 9,975; Iraq 13.
Sand other than metal-bearing	6,703	7,014	--	Greece 3,162; Albania 2,294.
Sulfur:				
Elemental:				
Crude including native and byproduct	1,138	2,039	--	Bulgaria 2,010; Hungary 29.
Colloidal, precipitated, sublimed	192	85	--	All to Australia.
Sulfuric acid	119	145	--	Italy 135; Sudan 5.
Talc, steatite, soapstone, pyrophyllite	810	630	--	Albania 610; Italy 20.

See footnotes at end of table.

Table 2.—Yugoslavia: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1980	1981	Destinations, 1981	
			United States	Other (principal)
NONMETALS —Continued				
Other:				
Crude	4,578	656	--	Pakistan 292; Austria 229.
Slag and dross, not metal-bearing	1,384	1,224	--	Austria 911; France 159.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	123	43	--	Iraq 22; East Germany 9.
Carbon: Carbon black	1,414	2,489	--	Czechoslovakia 2,448; Poland 36.
Coal: Lignite including briquets	397,493	520,131	--	Austria 463,210; United Kingdom 29,331; Italy 19,927.
Coke and semicoke	205,319	35,001	--	Hungary 24,300; Romania 10,699.
Peat including briquets and litter	481	1,510	--	Italy 749; Austria 679.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	3,601	2,655	(2)	Netherlands 2,373; Switzerland 172.
Mineral jelly and wax do.	30	19	--	West Germany 14; Italy 3.
Kerosine and jet fuel do.	222	318	1	United Kingdom 53; France 51.
Distillate fuel oil do.	105	265	2	Austria 175; West Germany 44.
Lubricants do.	397	370	--	West Germany 256; Czechoslovakia 52.
Residual fuel oil do.	47	26	--	Malta 10; U.S.S.R. 5.
Bitumen and other residues do.	(2)	64	--	Liechtenstein 44; Switzerland 18.
Bituminous mixtures do.	3	3	--	All to Libya.
Petroleum coke do.	24	43	--	All to West Germany.

NA Not available.

[1] Table prepared by Jozef Plachy.

[2] Less than 1/2 unit.

Table 3.—Yugoslavia: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1980	1981	Sources, 1981	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	217,595	394,180	--	Guinea 323,146; Greece 32,373.
Oxides and hydroxides	1,285	60,623	14	Guinea 57,429; France 1,961.
Metal including alloys:				
Unwrought	58,638	51,833	9	U.S.S.R. 42,992; Netherlands 2,495.
Semimanufactures	8,592	16,419	2	United Kingdom 5,730; France 3,394.
Antimony: Ore and concentrate	4,201	--		
Chromium:				
Ore and concentrate	278,799	325,498	--	Albania 223,498; U.S.S.R. 88,388.
Oxides and hydroxides	784	728	--	U.S.S.R. 550; West Germany 115.
Cobalt: Oxides and hydroxides	17	53	3	West Germany 39; Netherlands 6.
Copper:				
Ore and concentrate	47,817	11,561	--	Peru 10,755; Italy 806.
Sulfate	1,030	1,025	--	U.S.S.R. 1,018; Switzerland 6.
Metal including alloys:				
Scrap	--	88	--	All from Nigeria.
Unwrought	50,412	67,037	2	Zambia 31,023; Chile 16,943.
Semimanufactures	2,309	5,544	9	West Germany 2,693; Italy 1,263.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite thousand tons	1,640	1,360	--	Peru 757; India 231; Mauritania 174.
Metal:				
Scrap	395,759	479,327	(2)	U.S.S.R. 328,597; Bulgaria 37,510.
Pig iron, cast iron, related materials	48,677	97,858	1	Venezuela 25,106; West Germany 21,836; Brazil 20,355.
Ferroalloys:				
Ferrochromium	130	118	--	West Germany 85; Sweden 30.
Ferromanganese	903	539	--	West Germany 420; France 70.
Ferromolybdenum	740	522	--	Austria 248; Sweden 114.
Ferrosilicomanganese	--	15	--	All from France.
Ferrosilicon	1,519	1,556	--	West Germany 1,385; France 141.
Silicon metal	226	400	(2)	France 309.
Unspecified	3,592	3,225	--	West Germany 1,381; France 1,334.
Steel, primary forms	994,908	925,956	557	Czechoslovakia 313,770; U.S.S.R. 201,026.

See footnotes at end of table.

Table 3.—Yugoslavia: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1980	1981	Sources, 1981	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Semimanufactures:				
Bars, rods, angles, shapes, sections	222,768	271,284	3	Czechoslovakia 64,463; Poland 33,218; U.S.S.R. 30,318.
Universals, plates, sheets	471,182	566,219	54	Czechoslovakia 100,807; Italy 85,038; West Germany 73,282.
Hoop and strip	129,432	111,932	5	Poland 35,659; West Germany 35,382.
Rails and accessories	28,499	5,795	--	West Germany 2,276; Austria 1,840; U.S.S.R. 1,627.
Wire	43,374	37,464	2	Czechoslovakia 14,775; West Germany 5,516; Austria 3,369.
Tubes, pipes, fittings	69,601	85,357	18	East Germany 18,328; West Germany 15,552; Italy 11,692.
Castings and forgings, rough	2,639	2,722	27	Czechoslovakia 1,015; West Germany 451; Spain 407.
Lead:				
Ore and concentrate	2,731	1,023	--	All from Greece.
Oxides	2,994	2,939	4	Austria 1,028; Bulgaria 822.
Metal including alloys:				
Unwrought	10,161	12,118	--	Peru 6,588; Mexico 3,445.
Semimanufactures	23	62	10	West Germany 35; France 12.
Magnesium: Metal including alloys:				
Unwrought	863	35	--	Norway 24; France 10.
Semimanufactures	14	45	--	Switzerland 25; Austria 12.
Manganese:				
Ore and concentrate, metallurgical-grade	131,053	87,741	--	U.S.S.R. 41,211; Botswana 28,719.
Oxides	1,176	965	--	Netherlands 200; West Germany 192; Belgium-Luxembourg 158.
Mercury 76-pound flasks	541	1,305	NA	West Germany 522; United Kingdom 435; Netherlands 261.
Molybdenum: Metal including alloys, all forms	15	15	--	Austria 13.
Nickel:				
Matte and speiss	90	109	--	Netherlands 104.
Metal including alloys:				
Unwrought	1,960	2,150	1	U.S.S.R. 1,806; Canada 228.
Semimanufactures	776	1,084	200	West Germany 382; U.S.S.R. 212.
Platinum-group metals: Metals including alloys, unwrought and partly wrought:				
Platinum value, thousands	$1,329	$1,164	--	U.S.S.R. $364; West Germany $305.
Unspecified do	$1,559	$2	$2	
Silver: Metal including alloys, unwrought and partly wrought thousand troy ounces	16,543	547	(2)	West Germany 322; Sweden 129.
Tin: Metal including alloys:				
Unwrought	1,031	959	(2)	Malaysia 440; Bolivia 165; China 158.
Semimanufactures	36	95	(2)	West Germany 62; East Germany 17.
Titanium:				
Ore and concentrate	52,142	47,232	--	Australia 47,212.
Oxides	1,961	1,760	120	West Germany 921; Belgium-Luxembourg 339; France 307.
Tungsten: Metal including alloys:				
Unwrought	12	5	--	Austria 4; Poland 1.
Semimanufactures	12	8	(2)	Netherlands 3; West Germany 2.
Zinc:				
Ore and concentrate	65,227	56,385	--	Peru 13,564; North Korea 13,555.
Oxides	808	1,002	(2)	West Germany 725; Austria 156.
Metal including alloys:				
Unwrought	7,209	15,818	--	Zambia 6,702; West Germany 2,467; Algeria 2,033.
Semimanufactures	45	175	--	Italy 148; France 18.
Other:				
Ores and concentrates	1,832	5,728	--	China 2,516; Australia 1,249.
Oxides and hydroxides	1,304	1,239	5	West Germany 566; Norway 205.
Ashes and residues	2,022	1,882	--	Austria 1,003; Switzerland 879.
Base metals including alloys, all forms	703	441	114	Netherlands 156; West Germany 54.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	304	198	--	Denmark 92; Italy 55.

See footnotes at end of table.

Table 3.—Yugoslavia: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1980	1981	Sources, 1981	
			United States	Other (principal)
NONMETALS —Continued				
Abrasives, n.e.s. —Continued				
Artificial: Corundum	1,460	1,510	2	West Germany 1,208; Austria 205.
Dust and powder of precious and semiprecious stones including diamond value	$572,550	$662,499	$8,899	U.S.S.R. $345,725; Switzerland $235,947.
Grinding and polishing wheels and stones	656	667	15	Austria 264; Italy 120.
Asbestos, crude	60,023	57,762	20	U.S.S.R. 36,136; Canada 10,265.
Barite and witherite	1,146	490	--	Czechoslovakia 215; West Germany 203.
Boron materials:				
Crude natural borates	32,717	40,061	21,547	Turkey 17,527; Italy 987.
Oxides and acids	69	879	--	U.S.S.R. 551; France 285.
Bromine	60	86	--	Japan 70.
Cement	793,007	659,971	--	U.S.S.R. 301,936; Hungary 134,731; Czechoslovakia 103,090.
Chalk	1,108	975	--	France 504; United Kingdom 231.
Clays, crude:				
Chamotte earth	2,078	2,981	(2)	Czechoslovakia 2,085; France 759.
Fire clay	40,580	37,811	434	Czechoslovakia 35,386; Austria 820.
Kaolin	86,363	76,214	610	Czechoslovakia 38,034; East Germany 13,098; Greece 9,131.
Unspecified	12,030	7,887	(2)	Poland 5,086; Czechoslovakia 2,246.
Cryolite and chiolite	1,113	200	--	Denmark 199.
Diamond:				
Gem, not set or strung value	$531,982	$514,616	--	Belgium-Luxembourg $233,469; Switzerland $158,359; West Germany $122,788.
Industrial value, thousands	$2,988	$1,481	--	United Kingdom $607; Italy $511.
Diatomite and other infusorial earth	421	544	149	Italy 179; Austria 124.
Feldspar, fluorspar, related materials:				
Feldspar	1,154	1,094	--	France 1,088.
Unspecified	5,716	6,374	(2)	China 3,483; France 1,462.
Fertilizer materials: Manufactured:				
Ammonia	93,562	96,142	(2)	Hungary 60,350; Romania 16,098.
Nitrogenous	304,050	375,070	1,000	Hungary 168,456; U.S.S.R. 102,268.
Phosphatic	42,636	30,268	--	Tunisia 25,299; Romania 4,969.
Potassic	461,798	444,941	--	East Germany 265,479; U.S.S.R. 179,390.
Unspecified and mixed	101,355	94,474	53,480	Romania 15,731; Canada 9,935; Hungary 7,326.
Graphite, natural	1,843	1,601	2	Czechoslovakia 883; Austria 395.
Magnesium compounds:				
Magnesite	50,417	58,664	--	Greece 23,210; Turkey 16,446.
Other	26,012	31,506	(2)	Greece 17,880; North Korea 5,000.
Mica:				
Crude including splittings and waste	687	539	--	West Germany 319; India 70.
Worked including agglomerated splittings	132	129	(2)	Czechoslovakia 49; Austria 35.
Phosphates, crude thousand tons	1,383	1,058	--	Togo 471; Morocco 252; U.S.S.R. 108.
Pigments, mineral: Iron oxides and hydroxides, processed	2,154	3,261	--	U.S.S.R. 1,147; Spain 698.
Precious and semiprecious stones other than diamond:				
Natural value	$103,902	$165,991	--	West Germany $134,026; Sri Lanka $15,827; Belgium-Luxembourg $15,518.
Synthetic do	$358,420	$144,615	$6,139	Switzerland $51,876; Austria $31,148.
Pyrite, unroasted	68,413	49,232	--	U.S.S.R. 33,064; Cyprus 7,870.
Salt and brine	282,389	337,155	--	Romania 224,144; Tunisia 84,760.
Sodium compounds, n.e.s.: Carbonate, manufactured	75,391	78,174	--	Romania 28,079; Bulgaria 21,926.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	3,545	1,287	--	Italy 404; Austria 363.
Worked	1,574	(2)	--	All from Italy.
Dolomite, chiefly refractory-grade	25	125	--	West Germany 120.
Gravel and crushed rock	44,493	11,728	--	Hungary 11,416.
Limestone other than dimension	28,182	17,689	2	Hungary 14,999; Italy 2,688.
Quartz and quartzite	11,750	12,842	133	West Germany 7,890; Greece 4,698.
Sand other than metal-bearing	82,062	68,517	306	West Germany 28,373; Hungary 17,050; East Germany 16,924.

See footnotes at end of table.

Table 3.—Yugoslavia: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1980	1981	Sources, 1981	
			United States	Other (principal)
NONMETALS —Continued				
Sulfur:				
Elemental:				
Crude including native and byproduct	56,417	59,575	--	Poland 48,107; Mexico 5,472.
Colloidal, precipitated, sublimed	506	479	--	West Germany 253; Poland 160.
Dioxide	529	337	--	All from Italy.
Sulfuric acid	63,913	107,915	([2])	Hungary 70,021; Greece 10,874.
Other:				
Crude	14,728	19,182	1	Hungary 10,236; U.S.S.R. 4,200.
Slag and dross, not metal-bearing	439,950	255,144	--	Italy 244,841; Canada 4,861.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,615	1,418	807	Albania 600.
Carbon: Carbon black	21,855	29,634	23	Italy 20,541; U.S.S.R. 3,831.
Coal:				
Anthracite thousand tons	137	208	--	U.S.S.R. 207.
Bituminous do	3,421	3,614	1,443	U.S.S.R. 1,633; Czechoslovakia 448.
Lignite including briquets do	112	157	--	East Germany 97; U.S.S.R. 58.
Coke and semicoke	54,745	35,078	--	Italy 24,071; West Germany 6,493.
Gas, natural million cubic feet	63	74	--	All from U.S.S.R.
Peat including briquets and litter	9,722	8,198	--	Hungary 3,419; Poland 2,959.
Petroleum:				
Crude thousand 42-gallon barrels	81,215	69,364	--	U.S.S.R. 33,087; Iraq 10,403; Libya 7,379.
Refinery products:				
Liquefied petroleum gas do	974	1,122	([2])	Hungary 467; West Germany 322; Bulgaria 288.
Gasoline do	81	34	([2])	Italy 27; Netherlands 6.
Mineral jelly and wax do	20	21	([2])	West Germany 10; East Germany 3.
Kerosine and jet fuel do	137	161	--	Czechoslovakia 57; Greece 56.
Distillate fuel oil do	1,512	646	5	U.S.S.R. 556; Romania 81.
Lubricants do	669	753	7	Bulgaria 170; Italy 111.
Residual fuel oil do	4,626	5,490	--	Bulgaria 1,462; Greece 1,411; U.S.S.R. 1,277.
Bitumen and other residues do	21	8	--	Austria 7.
Bituminous mixtures do	4	2	([2])	Netherlands 1.
Petroleum coke do	293	340	217	U.S.S.R. 52; Norway 42.

NA Not available.

[1] Table prepared by Jozef Plachy.

[2] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—During 1983, major aluminum producers operated their facilities at 25% to 40% of capacity because of electric power shortages.

Energoinvest of Sarajevo, one of the largest industrial concerns in the country, reported on the future of the Obrovac alumina plant located near Zadar, Croatia, which had been closed because of financial difficulties. Energoinvest believed the Obrovac plant may become profitable by substitution of coal for fuel oil, increased automation, and extensive exploration for new bauxite reserves in the area.

Copper.—At the Majdanpek opencast mine, located near Bor, northwest of Zajecar, Serbia, and also operated by RTB Bor, a new installation for crushing in closed circuit was commissioned. Reportedly, recovery of copper should increase by 2,000 tons per year. The new mine at Krivelj, near Bor, another part of the RTB Bor complex, had problems in meeting its planned targets. Additional funds, which were necessary to complete some of the installations in the project, were not available. The management hoped to receive additional funding from the central Government because full operation of the Krivelj Mine should end imports of copper concentrates.

At Bor, exploration continued on a deep deposit, Borska Reka, which in the future should replace the mines presently in production.

Iron and Steel.—The iron and steel industry had a very difficult year and economic results in all steel plants were disappointing. Lack of foreign currency, high indebtedness, and shortages of energy in all forms resulted in lower production. In addition, difficulties with foreign currencies lowered the imports of materials used in rolling mills by 33% when compared with imports in 1982.

Development continued of the Omarska iron ore mine, located 20 kilometers southwest of Prijedor in BiH. Some delays were experienced because funds from the Central Bank were not available on time. The Omarska Mine was expected to be on-stream sometime in 1985, so that imports of iron ore would no longer be necessary.

A 30,000-ton-per-year tin plate rolling mill, operated by the Zorka Chemical Combine, went on-stream in 1983 at Sabac, Serbia. The plant operated on imported plates because the steel plant at Smederevo could not deliver the necessary plates.

The management of the Jesenice steel plant in Slovenia has decided to replace its old Siemens Martin steel shop with an electric furnace shop. Capacity of the new shop was reported to be 210,000 tons of steel per year.

Natural gas arrived at the Zenica steel complex in BiH. In addition to obtaining an uninterrupted supply, Zenica should save 200,000 tons of fuel oil annually by using natural gas.

Lead and Zinc.—Efforts continued to increase mine production of lead and zinc ores in the country. A new flotation plant was commissioned at Trepca, the largest lead-zinc mine in Yugoslavia. Capacity of the new plant was 1 million tons of ore per year that could be expanded by an additional 500,000 tons per year. Equipment for the flotation plant was mostly imported from the U.S.S.R. and the United Kingdom. In recent years, the grade of ore has declined in Trepca, while at the same time Yugoslav lead and zinc smelting capacities were being increased. Mine output of concentrates started to fall behind demand, and lead and zinc concentrates had to be imported, adding to Yugoslavia's balance-of-payment problems. The new mill at Trepca should eliminate imports of concentrates in the future.

Development of the Sastavci-Kizevak lead and zinc mine at Kopaonik Mountain, in Serbia, was underway in 1983. When completed sometime in 1985, the new mine should produce yearly about 200,000 tons of ore and yield 8,000 tons of zinc concentrates and 4,800 tons of lead concentrates. In addition, 4 tons of silver and 10,000 tons of pyrite may be recovered.

At the Rudnik Mine near Gornji Milanovac, Serbia, new underground equipment, mostly nonrail, was introduced in 1983. In addition, a recently discovered ore body was prepared for introduction of the room-and-pillar mining method. The aim is to increase the Rudnik Mine output to 400,000 tons of ore per year.

At the Suplja Stijena Mine near Plevlja, Montenegro, bids were asked for design of an opencast mine and a crushing and milling installation with an annual capacity of 800,000 tons of ore.

In May, a zinc oxide plant rated at 10,000 tons per year went on-stream at the Zletovo lead and zinc smelter near Titov Veles, Macedonia.

Modernizations and expansions of the lead smelter and refinery at Zvecan, construction of a secondary lead plant for recovery of lead from batteries, and expansion of the zinc electrolytic plant at Titova Mitrovica were delayed because of lack of funds. Representatives of banks and Trepca concluded financial arrangements for financing Trepca's projects. Reports indicated that when all planned work is completed, the lead smelter refinery should double the present capacity and that the Titova Mitrovica zinc electrolytic plant should be capable of producing four times more zinc than at present.

Mercury.—The Idrija Mine in Slovenia resumed production in April after a 6-year closure. Initially, output should come from the old pit. Later a new pit was planned to start production and plans called for production of about 9,000 flasks of mercury per year.

Nickel.—During August 1983, the new nickel mines and a new smelter became operational in the Cikatovo-Glavica-Glogovac area west of Pristina in Kosovo, Serbia. Two mines, Glavica and Cikatovo, should deliver about 1 million tons per year of ore to the smelter at Glogovac. The Glogovac smelter was planned to produce 60,000 tons of ferronickel per year containing 12,000 tons of nickel. Ore reserves in the Cikatovo-Glavica area were reported to range between 12 and 27 million tons averaging 1.032% nickel and 0.07% cobalt. The operation is part of the Rudarsko Energetsko Metalurski Hemijski Kombinat Kososvo of Pristina in Kosovo, Serbia, and operates under the name of Rudnik i Topionica Feronikl. Approximately 1,800 persons are employed in the mining and smelting facilities. The basic design for the smelter was prepared in the U.S.S.R., and the mine project was prepared by the Rudarski Institute in Beograd. Equipment for the smelter was purchased in Denmark, the Federal Republic of Germany, Norway, and the U.S.S.R. Most of the nickel produced by the new plant was to be exported.

The commissioning of the Kosovo nickel complex brings the total ferronickel capacity of the country to 120,000 tons with 28,000 tons of contained nickel. The other ferronickel producer was the Kavadarci smelter, with a mine at Rzanovo in Macedonia, operated by Feni.

Both the Kavadarci Mine and the ferronickel plant failed to produce at design capacities. Consumption of electric power was higher than anticipated, ore grade was lower than previous reports indicated, and the supply of electric power was irregular leading to huge financial losses equivalent to about US$64 million.[2] Documentation was prepared to prove that the Kavadarci Mine and the ferronickel plant should be closed because losses cannot be avoided in the future. A report was prepared and distributed to the members of the state Parliament (Sobranje) urging closure of the mine and smelter. The Parliament has scheduled a meeting to examine the Kavadarci situation in early 1984.

NONMETALS

Asbestos.—At yearend 1983, a new complex for production of asbestos and its products at Stragari near Kragujevac was near completion. Annual capacity was rated at 50,000 tons of asbestos fiber, 13,000 tons of asbestos paper, and 6,500 tons of asbestos panels. The nearby opencast asbestos mine, Stragari, with an annual capacity of 500,000 tons, should provide raw materials for the new complex. The complex and the new mine were operated by Asbestos Kolubara, an enterprise that is part of Rudarsko Energetsko Industrijski Kombinat Kolubara.

Cement.—The cement industry suffered from shortages of heavy fuel oil. Several cement plants had to stop production for several days because of lack of fuel. The 500,000-ton-per-year cement plant at Kosjeric, near Gornji Milanovac, Serbia, lost 1 month's production owing to a lack of fuel oil.

To ensure uninterrupted production of cement, the Dalmacija Cement Enterprise, which operates several cement plants near Split, Croatia, started to switch its energy sources from fuel oil to coal. Reports indicated that the changeover should be completed by the end of 1984. Although coal for use in cement plants has to be imported from the U.S.S.R., the advantage should be in saving hard currency needed for imports of fuel oil, but not needed for imports of coal from the U.S.S.R.

Gypsum.—The Japra Enterprise, one of the largest producers of gypsum and dolomite in the country, has announced an agreement for joint financing of the expansion of Japra's facilities at Blagaj near Bosanki Novi, BiH. Reserves of gypsum at Blagjaj were reported at 100 million tons of gypsum and more than 1 billion tons of dolomite.

Magnesite.—A new magnesite mine located on the slopes of the Konjuh Mountain, near Kladanj in BiH, went on-stream at yearend. The mine was operated by Vatrostalna, of Zenica, which is part of RMK Zenica. The mine was rated at 72,000 tons per year of magnesite. In addition, near the minesite, construction continued on a beneficiation plant and a sintering installation. The mine is reportedly based on reserves of 2.5 million tons of magnesite. Vatrostalna plans to use magnesite from the Kladanj Mine for production of refractories. A possible decline of 29% of imports of refractories was estimated after the Kladanj Mine starts production at full capacity.

Phosphate.—Exploration of the deposit and laboratory tests on use of ore from the only large phosphate deposit in the country, the Lisina deposit located near Bosilegrad in Serbia, continued. Two enterprises, RTB Bor and Zorka-Sabac, conducted tests with the ores from Lisina. During the year, both organizations submitted preliminary reports indicating that a possibility exists for use of ores from Lisina in fertilizers. Lisina ore contains large quantities of iron, which is undesirable in production of phosphoric acid and which must be eliminated by flotation. In the past, the need for flotation has made ores from the Lisina deposit uneconomic compared with imported ores. However, the difficult economic situation of the country and lack of foreign currency may make Lisina ores more attractive in the future.

Salt.—A new plant for production of sea salt near the town of Ulcinj, Montenegro, started production in 1983. Capacity was reported at 75,000 tons of salt per year. The installation was built under license from Lurgi GmbH, the Federal Republic of Germany.

MINERAL FUELS

Shortages of electric power, liquid fuels, and coals severely affected production of minerals and all other industrial goods. Rationing of gasoline was imposed as one of the conservation measures. Electric power was cut to households in large cities for as long as 8 to 12 hours per day. Financial losses throughout the mineral industry were extremely high.

Coal.—In September, the 2-million-ton-per-year Drmno opencast lignite mine near Kostolac in Serbia started production, delivering to the nearby powerplant. Mine design allowed increased output of up to 6 million tons of lignite per year.

In the Kolubara coal basin, located near Lazarevac, Serbia, work continued on design and construction of facilities for upgrading the low-calories lignite mined in the basin. Construction began on a lignite drying plant at Vreoci near Lazarevac, Serbia. In addition, plans were made to build a lignite gasification plant and a lignite briqueting plant, both near the other lignite-processing installations at Vreoci.

At the Zenica brown coal mine, near Zenica, BiH development of the Moscanica Mine was underway. After completing drilling of 20 exploratory wells with a total length of 6,000 meters and completing followup work, recoverable and proven reserves were reported at 60 million tons of coal. Coal resources in the area were estimated at 150 million tons. The quality of the brown coal is reportedly the best in the country, and in part, suitable for household fuel. Development of an opencast and an underground mine started during the year, with an aggregate capacity of 3 million tons per year. A new and modern separation plant would also recover fines for use in cement plants.

Exploration for coal was intensive and some discoveries resulted. At Miljevina, BiH, a new brown coal deposit was delineated and proven reserves were reported at 6 million tons. At Vrdnik, west of Novi Sad, Serbia, and in the general area of the closed Vrdnik coal mine, exploration discovered an additional 30 million tons of coal. A new mine was planned with an annual capacity of 340,000 tons of coal.

During the year two accidents, one in the Aleksinac Mine and the other in the Mramor Mine near Tuzla, killed several miners and some equipment was lost.

Oil Shale.—The high price of imported crude oil, coupled with the lack of foreign exchange, made the 10,000 million tons of oil shale reserves in Serbia more attractive as a potential domestic source of synthetic crude oil. About 3,000 million tons of the shale is located near Aleksinac, Serbia, with an average oil content of 10 liters per ton. Energoprojekt of Beograd received an order to design an installation that would mine and process Aleksinac oil shales.

Petroleum and Natural Gas.—Despite financial difficulties and a lack of spare parts, the petroleum industry recorded some significant discoveries of oil and gas offshore and onshore. Offshore Adriatic exploration was being conducted by the Yugoslav enterprise INA, by three international consortia formed with INA, and by a joint venture between Kotor-Yugopetrol and Buttes Gas and Oil; together these covered almost all offshore exploration in the Yugoslav Adriatic. Reports indicated discovery of oil in the Jadran-13 well, located about 10 miles southwest of Dugi Otok Island in the Adriatic. The semisubmersible rig, Zagreb I, reportedly struck oil at a depth of about 4,500 meters. The pay zone was reported to be 104 meters thick. After inital euphoria, later reports were more cautious about the significance of the discovery.

Onshore discoveries of a gasfield near Kalinovac, Slovenia, and an oilfield near Deletovci and Ilaca were made in spite of reduced exploratory activities. Because of difficulties in purchasing equipment from abroad, owing to the lack of foreign exchange, Kalinovac and other fields will not be immediately developed. In Semeberia, Naftagas of Novi Sad started an exploratory program involving eight wells, the first located outside of Bijeejina, on the road to Brcko in BiH.

The refinery at Lendava, Slovenia, received all equipment from abroad for expansion of capacity to 2 million tons per year. With present market conditions, existing refinery capacity was more than enough, and a new refinery appeared not to be needed. The equipment probably would be sold and the spur of the trunk pipeline will remain inground but wll not be used.

Uranium.—At the Zirovski Vrh uranium mine near Skofja Loka, Slovenia, exploration in the vicinity of the mine has confirmed existance of additional reserves, apparently large enough to produce fuel for two nuclear powerplants of the same size as the Krsko plant in Slovenia. Construction of the mine and yellow cake plant at Zirovski Vrh was behind schedule during 1983 because of late receipt of financing from the utilities.

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[1] Physical scientist, Division of Foreign Data.

[2] Dinar (din) is not convertible currency. A meaningful conversion to U.S. currency is impractical. At yearend, the official exchange rate was 110din = US$1.00.

The Mineral Industry of Zaire

By George A. Morgan[1]

The mining industry dominated Zaire's economy in 1983, despite depressed markets for major mineral commodities and financial difficulties for nearly all operating companies. Zaire was estimated to be the leading world producer of cobalt and diamond, and it was among the top six world producers of copper. La Générale des Carrières et des Mines du Zaire (Gécamines), a state-controlled company, accounted for most of the mining activity in the nonfuel minerals sector of the country and produced copper, cobalt, zinc, cadmium, germanium, sulfuric acid, lime, and cement.

Gécamines experienced cash flow problems. It was permitted to retain only 45% of the foreign currency generated from the sale of its products. The remaining 55% was paid to the Bank of Zaire, to be drawn on in zaires (Z), the national currency.

Production and consumption of electricity from hydroelectric plants in Shaba Province was by and for the use of Gécamines. The availability of electric power from the Inga power station on the Zaire River permitted the refurbishing of the older powerplants in Shaba Province. The Inga direct-current power line, operational for about 1 year with a power transmission of 100 to 125 megawatts, was connected to the Kolwezi converter station for inversion to alternating current and integration into the local power network. The maximum power level attainable was 560 megawatts, and the line provided about 20% to 25% of the power demands of the Province.

The country's total external debt was put at about $5 billion. Zaire devalued its currency in September from Z6.06=US$1.00 to Z29.90=US$1.00. The black market level was estimated at Z30 to Z35=US$1.00.[2] In December, the leading creditor nations agreed to reschedule $1 billion in debt falling due in 1983 and 1984. The International Monetary Fund provided standby credit of $350 million. The standby credit was for a period of 8 years with a 5-year grace period. Funds were also extended by the International Bank for Reconstruction and Development (World Bank) and other organizations directly aimed at upgrading the transportation sector and Gécamines' open pit mining operations.

PRODUCTION AND TRADE

The Government became the sole producer of copper with its purchase of the Musoshi and Kinsenda Mines in southern Shaba Province. The mines had been owned by a Japanese mining consortium. Zinc recovery was near the 1982 high owing to higher zinc grades with depth in the Kipushi Mine. Cadmium output also improved. Cobalt was stockpiled as an intermediate product for future recovery owing to depressed market conditions. Cobalt metal output was down to about 5,300 tons, well below the estimated capacity of 18,000 tons per year.

Fuel shortages and equipment servicing and replacement problems adversely affected tin output and byproduct recovery of columbite, tantalite, and tantaliferous slag from tin smelting. Recovery of gold from the Kilo-Moto areas of northeastern Zaire declined owing to lack of organization, loss of personnel, and equipment problems.

Exploration continued for crude petroleum, and reports of new oil discoveries offshore brought forward proposals to redesign the Moanda refinery, the country's sole petroleum refinery. The plant, which commenced operation in 1969 and reached about 5.4 million barrels of refined product production in 1973, has been operating at well below capacity for several years. Local requirements for diesel fuel, gasoline, kerosine, and lubricants, mainly for the mining sector, have been met by imports. Imports of these products were well over twice the amount supplied by the Moanda refinery.

Matadi was the main port of shipment for copper with 231,000 tons exported in 1983, followed by about 197,000 tons from South African ports and 50,000 tons from Dar es Salaam. Cobalt amounting to 1,200 tons was shipped through South African ports with 690 tons sent through Dar es Salaam. South African ports also handled 40,000 tons of zinc ingot compared with 26,000 tons at Matadi and 15,000 tons at Dar es Salaam.

The International Development Association (IDA) loaned $26 million for a $73.3 million railroad project to be undertaken by the Société Nationale des Chemins de Fer Zairoise (SNCZ). The project was to include renewal of 128 kilometers of track, rehabilitation of 850 railcars, and purchase of 200 railcars, equipment, and spare parts for track, engine, and railcar maintenance, as well as training and consulting services. Other contributors to the project included SNCZ, $10.7 million; the Belgium Government, $5.85 million; Caisse Centrale de Cooperation Economique of France, $6.25 million; the African Development Bank, $14.1 million; and others, $10.4 million.

Table 1.—Zaire: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982^{p}	1983^{e}
METALS					
Cadmium, smelter	212	168	230	280	308
Cobalt:					
Mine output, metal content^{e}	^{r}15,000	^{r}15,400	^{r}15,400	11,300	11,300
Refined	^{r}14,029	^{r}14,482	11,124	5,573	5,300
Columbium-tantalum concentrate:					
Gross weight kilograms	32,000	92,000	75,000	80,000	80,000
Columbium content^{e} do.	9,000	25,800	20,400	22,000	22,000
Tantalum content^{e} do.	6,800	19,500	20,800	22,900	22,900
Copper:					
Mine output, metal content[2]	^{r}430,400	^{r}539,500	555,100	519,000	535,000
Blister and leach cathodes	^{r}382,400	^{r}447,800	480,400	473,500	466,600
Refined	^{r}103,100	144,000	151,300	175,000	226,700
Gold[3] troy ounces	73,368	40,864	64,430	62,233	60,000
Manganese ore and concentrate	--	^{r}6,321	18,214	--	--
Monazite concentrate, gross weight	90	51	35	32	30
Silver thousand troy ounces	2,954	2,733	2,580	1,751	2,000
Tin:					
Mine output, metal content	3,879	^{r}3,159	3,321	3,144	3,000
Smelter, primary	458	216	450	353	150
Tungsten, mine output, metal content	210	134	89	74	75
Zinc:					
Mine output, metal content	73,000	67,000	63,300	82,100	74,700
Metal, primary, electrolytic	^{r}43,700	^{r}43,800	57,600	64,400	62,400
NONMETALS					
Cement, hydraulic thousand tons	450	443	408	^{e}400	400
Diamond:					
Gem^{e} thousand carats	294	345	450	450	3,172
Industrial^{e} do.	8,440	9,890	8,550	8,550	8,266
Total do.	8,734	10,235	9,000	9,000	11,438
Lime	115,300	113,600	123,500	103,800	120,000
Sulfur:					
Byproduct of metallurgy, S content of sulfuric acid from sphalerite^{e}	25,700	24,800	25,000	25,000	36,000
Sulfuric acid, gross weight	135,100	142,700	142,900	146,400	150,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous thousand tons	225	287	240	229	330
Petroleum:					
Crude thousand 42-gallon barrels	^{r}7,535	^{r}6,566	7,669	8,270	9,289
Refinery products:					
Gasoline do.	483	530	NA	117	120
Kerosine and jet fuel do.	319	346	NA	88	80
Distillate fuel oil do.	682	706	NA	128	130
Residual fuel oil do.	1,252	1,273	NA	261	260

See footnotes at end of table.

Table 1.—Zaire: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982^p	1983^e
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum —Continued					
Refinery products —Continued					
Liquefied petroleum gas thousand 42-gallon barrels	21	6	NA	1	1
Refinery fuel and losses do	[4]173	154	NA	60	60
Total do	2,930	3,015	NA	655	651

^{e}Estimated. ^{p}Preliminary. ^{r}Revised. NA Not available.
[1]Table includes data available through July 25, 1984.
[2]Content of concentrate produced.
[3]Excludes gold recovered from blister copper.
[4]Reportedly includes 75,000 barrels of unfinished oil shipped elsewhere for future refining.

Table 2.—Zaire: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Cadmium: Metal including alloys, all forms	187	243	--	Belgium-Luxembourg 213; West Germany 30.
Cobalt: Metal including alloys, all forms	2,530	3,674	1,873	France 971; Taiwan 451; West Germany 340.
Columbium and tantalum: Ore and concentrate	72	82	82	
Copper:				
Ore and concentrate	102,843	83,093	--	Japan 83,076; United Kingdom 17.
Matte and speiss including cement copper	374	408	--	All to Greece.
Ash and residue containing copper	256	--		
Metal including alloys:				
Scrap	1,086	334	--	West Germany 261; Belgium-Luxembourg 72.
Unwrought	406,319	390,755	34,530	Belgium-Luxembourg 281,982; West Germany 26,361.
Gold:				
Waste and sweepings value	--	$109,700	$109,700	
Metal including alloys, bullion do	--	$100,000	$100,000	
Indium: Metal including alloys, all forms	148	--		
Iron and steel: Metal:				
Scrap	3,760	--		
Ferrochromium	--	94	--	All to Sweden.
Lead: Ore and concentrate	91	158	--	All to France.
Manganese: Ore and concentrate, metallurgical-grade	12,858	16,287	--	Belgium-Luxembourg 15,742; France 545.
Silver:				
Ore and concentrate[2] value, thousands	$211	[3]$3,189	--	All to United Kingdom.
Metal including alloys, unwrought and partly wrought do	$48	$39	--	All to Belgium-Luxembourg.
Tin:				
Ore and concentrate	2,610	2,337	--	Netherlands 1,320; Malaysia 1,017.
Oxides	189	(4)		
Metal including alloys, unwrought	--	218	--	Belgium-Luxembourg 153; West Germany 55.
Tungsten: Ore and concentrate	75	74	63	France 11.
Uranium and thorium: Ore and concentrate value, thousands	$34	$86	--	All to France.
Zinc: Metal including alloys, unwrought	69,900	30,397	22,408	Greece 2,372; Taiwan 1,989; Pakistan 1,497.
Other:				
Ores and concentrates	36	145	--	France 106; Austria 18; Belgium-Luxembourg 15.
Ashes and residues	215	1,733	--	West Germany 976; Belgium-Luxembourg 127.
Base metals including alloys, all forms	47	1,241	--	France 973; Belgium-Luxembourg 213.

See footnotes at end of table.

Table 2.—Zaire: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.: Dust and powder of precious and semiprecious stones including diamond carats	865,194	565,805	--	All to Japan.
Diamond:				
Gem, not set or strung value, thousands	$36,547	$31,549	$3,425	Belgium-Luxembourg $28,063; Austria $18; Switzerland $18.
Industrial do	[5]$30,832	[6]$2,349	--	West Germany $1,565; Switzerland $540; Austria $235.
Dust and powder do	--	$93	$93	
Precious and semiprecious stones other than diamond:				
Natural do	$977	[7]$884	$208	Switzerland $564; West Germany $77.
Synthetic do	$11	$2	--	All to Italy.
Stone, sand and gravel: Dimension stone, worked do	$12	--		
MINERAL FUELS AND RELATED MATERIALS				
Petroleum:				
Crude[8] thousand 42-gallon barrels	[r]5,907	5,886	NA	NA.
Refinery products: Residual fuel oil do	253	NA	NA	NA.

[r] Revised. NA Not available.

[1] Table prepared by Virginia A. Woodson. Owing to the lack of available official trade data published by Zaire, this table should not be taken as a complete presentation of this country's mineral exports. These data have been compiled from various sources, which include United Nations information and data published by the trading partner countries. Unless otherwise specified, data are compiled from trade statistics of individual trading partners.

[2] May include waste and sweepings.

[3] May include platinum-group metals.

[4] Unreported quantity exported to the United States valued at $226,264.

[5] Excludes 1,500 carats exported to Canada.

[6] Excludes 90,847 carats exported to Japan and 2,700 carats to Thailand.

[7] Excludes 12,690,000 carats exported to Japan and 7,650,000 carats to Taiwan.

[8] Energy Balances of Developing Countries, 1971/82, International Energy Agency, OECD, Paris, France, 1984.

Table 3.—Zaire: Apparent imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	--	33	--	All from United Kingdom.
Metal including alloys, semimanufactures	621	649	--	Belgium-Luxembourg 373; Hong Kong 105; France 87.
Copper: Metal including alloys:				
Unwrought	--	47	--	Belgium-Luxembourg 46; West Germany 1.
Semimanufactures	133	32	--	Belgium-Luxembourg 21; Japan 6.
Iron and steel: Metal:				
Ferroalloys:	56	19	--	All from Belgium-Luxembourg.
Steel, primary forms	268	1,747	--	Japan 1,628; West Germany 95.
Semimanufactures:				
Bars, rods, angles, shapes, sections	11,439	10,659	--	Belgium-Luxembourg 7,189; France 1,555; West Germany 983.
Universals, plates, sheets	23,511	20,692	--	Belgium-Luxembourg 12,188; Japan 5,783; France 1,354.
Hoop and strip	729	844	--	Belgium-Luxembourg 597; West Germany 167.
Rails and accessories	397	7,866	--	France 7,318; Belgium-Luxembourg 490.

See footnotes at end of table.

Table 3.—Zaire: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel: Metal —Continued				
Semimanufactures —Continued				
Wire	678	1,236	--	Belgium-Luxembourg 726; West Germany 410.
Tubes, pipes, fittings	8,529	7,832	369	France 2,130; Belgium-Luxembourg 1,973; Japan 1,292.
Castings and forgings, rough	737	2,884	--	Italy 2,806; Belgium-Luxembourg 46.
Lead:				
Oxides	103	22	--	France 12; West Germany 10.
Metal including alloys, unwrought	225	154	--	West Germany 83; Belgium-Luxembourg 71.
Nickel: Metal including alloys, semimanufactures -- value, thousands	$12	--		
Platinum-group metals: Metals including alloys, unwrought and partly wrought do	$2	$8	--	Belgium-Luxembourg $6; France $2.
Silver: Metal including alloys, unwrought and partly wrought do	$329	$139	--	Belgium-Luxembourg $91; Switzerland $48.
Titanium: Oxides	62	8	--	All from United Kingdom.
Zinc:				
Oxides	14	3	--	Italy 2; France 1.
Blue powder	2	--		
Metal including alloys, semimanufactures	21	4	--	All from Belgium-Luxembourg.
Other: Oxides and hydroxides	--	20	--	All from United Kingdom.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	49	40	(2)	Belgium-Luxembourg 25; West Germany 6.
Asbestos, crude	185	17	16	France 1.
Barite and witherite	18	227	--	All from Netherlands.
Cement	3,092	1,455	--	Belgium-Luxembourg 1,356; France 99.
Chalk	61	34	--	All from France.
Clays, crude	299	3	--	All from Belgium-Luxembourg.
Diamond:				
Gem, not set or strung value, thousands	$244	$148	--	All from Switzerland.
Industrial do	$3	$1	--	Do.
Diatomite and other infusorial earth	86	116	--	France 98; Belgium-Luxembourg 18.
Feldspar	47	--		
Fertilizer materials: Manufactured:				
Ammonia	118	61	--	Netherlands 55; West Germany 5.
Nitrogenous	7,534	13,749	--	France 11,925; Japan 1,149; West Germany 500.
Phosphatic	105	--		
Potassic	1,591	10	--	All from West Germany.
Unspecified and mixed	13,976	3,537	--	Belgium-Luxembourg 2,098; Japan 1,069.
Gypsum and plaster	7,512	16	--	Belgium-Luxembourg 11; West Germany 5.
Lime	551	21,780	--	Belgium-Luxembourg 21,697; United Kingdom 60.
Magnesite	56	--		
Mica: Crude including splittings and waste	13	2	--	All from Belgium-Luxembourg.
Phosphates, crude	460	728	--	Do.
Pigments, mineral:				
Natural, crude	45	--		
Iron oxides and hydroxides, processed	78	48	--	West Germany 43; France 5.
Salt and brine	5,598	353	--	Belgium-Luxembourg 210; West Germany 123.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	2,481	783	18	West Germany 725; United Kingdom 40.
Sulfate, manufactured	6,226	--		
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	50	34	--	All from Italy.
Worked	2	159	--	France 51; Italy 49; Belgium-Luxembourg 46.
Dolomite, chiefly refractory-grade	50	1	--	All from West Germany.
Gravel and crushed rock	26	171	163	Belgium-Luxembourg 8.
Quartz and quartzite	7	4,124	--	West Germany 4,120; Italy 4.
Sand other than metal-bearing	148	140	136	West Germany 4.

See footnotes at end of table.

Table 3.—Zaire: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Sulfur:				
Elemental:				
Crude including native and byproduct	122	13	--	France 8; West Germany 5.
Colloidal, precipitated, sublimed	6	6	--	Belgium-Luxembourg 4; Italy 2.
Dioxide	342	--		
Sulfuric acid	--	150	17	Belgium-Luxembourg 99; Netherlands 30.
Talc, steatite, soapstone, pyrophyllite	138	235	--	France 112; Republic of Korea 87.
Other: Crude	206	--		
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	392	40	--	All from Belgium-Luxembourg.
Carbon: Carbon black	904	457	1	West Germany 434; Italy 14.
Coal:				
Anthracite and bituminous	150	--		
Briquets of anthracite and bituminous coal	21	--		
Coke and semicoke	215	--		
Petroleum:				
Crude[3] thousand 42-gallon barrels	[r]5,702	5,494	NA	NA.
Refinery products:				
Liquefied petroleum gas 42-gallon barrels	23	--		
Gasoline, motor do	184,992	159,649	--	Netherlands 81,541; France 67,142.
Mineral jelly and wax do	3,502	2,556	141	West Germany 826; Netherlands 370; France 283.
Kerosine and jet fuel do	139,206	170,586	--	Netherlands 104,672; France 65,867.
Distillate fuel oil do	918,116	41,537	--	France 41,418; Belgium-Luxembourg 119.
Lubricants do	117,121	86,656	1,515	France 59,661; Netherlands 12,789; Belgium-Luxembourg 11,249.
Nonlubricating oils do	2,034	--		
Residual fuel oil do	--	15,237	--	Netherlands 15,104; Italy 133.
Asphalt do	--	745	745	
Bitumen and other residues do	545	903	--	Belgium-Luxembourg 818.
Bituminous mixtures do	7,781	2,653	--	Belgium-Luxembourg 2,589; Italy 40.
Petroleum coke do	6,418	--		
Unspecified value	--	$602	--	All from Japan.

[r]Revised. NA Not available.

[1]Table prepared by Virginia A. Woodson. Owing to the lack of available official trade data published by Zaire, this table should not be taken as a complete presentation of mineral imports of this country. These data have been compiled from various sources, which include United Nations information and data published by the trading partner countries. Unless otherwise specified, data are compiled from trade statistics of individual trading partners.

[2]Less than 1/2 unit.

[3]Energy Balances of Developing Countries, 1971/1982, International Energy Agency, OECD, Paris, France, 1984.

COMMODITY REVIEW

METALS

Cobalt.—Cobalt was produced as a byproduct of copper mining by Gécamines. Metal output was again reduced owing to poor market conditions. Plants located at Likasi and Luilu produced electrowon cobalt from copper leach solutions. Copper ores from the western and central mining districts in Shaba Province were the feed materials and were all concentrated prior to leaching. Copper-cobalt sulfide concentrates, mainly from the Kambove and Kamoto concentrators, were roasted and initially leached for copper. A portion of the leachate was then purified further, and cobalt was deposited as cathodes. Copper-cobalt dolomite concentrates and copper-cobalt oxide concentrates generally went directly to the leach plants. Cobalt cathode was refined and processed to granules at Likasi and then shipped to Luilu for degassing along with cobalt flakes produced at Luilu. In 1983, most cobalt was shipped from Luilu through ports in the Republic of South Africa. The remainder was shipped through Matadi in Zaire on the Atlantic coast and Dar es Salaam in Tanzania on the Indian Ocean.

Gécamines marketed cobalt through the state-owned Société Zairoise de Commercialisation de Minerais (Sozacom). Sozacom used Afrimet Indussa Corp. as its sales agent in the United States. During the year, Sozacom contracted to sell the General Services Administration of the United States 4 million pounds of cobalt at $5.50 per pound. Shipments were to commence January 1, 1984.

Columbium-Tantalum.—Output of columbite-tantalite was as a byproduct of tin mining by Société Minière et Industrielle de Kivu (Sominki) and Société Zairetain, the latter a subsidiary of Geomines Cie. of Belgium.

Output by Sominki, 80% controlled by Cogemines of the Empain-Schneider Group, was from eluvial and alluvial deposits in Kivu. Concentrates were shipped by river boats via Kindu. A reassessment of reserves was underway for possible expansion of output.

Geomines' operation at Manono in Shaba Province produced tantalite mainly from underground mining in hard rock. Output was reduced in the past few years owing to low tin prices, increased costs of underground mining, and poor infrastructure. Mining had been from opencast mines in eluvial and alluvial deposits. Reserves were reported as large, and the tantalum content of previous tin mine wastes was believed recoverable. Tantalum-bearing slag from the Manono tin smelter was also exported. Output was 93 tons in 1982 and 105 tons in 1981. Compagnie Française de Mines (Coframines) of France expected to mine small quantities of tantalite as a byproduct of alluvial tin operations in Kania, south-southwest of Manono. Output was entirely dependent upon the market for tin. Coframines was 64% controlled by the Bureau de Recherches Géologiques et Minières (BRGM) of France.

Copper.—Output of copper was by two companies: the state-owned Gécamines and the Société de Development Industriel et Minière du Zaire (Sodimiza). Gécamines was the major producer and also accounted for the country's entire output of cobalt, zinc, cadmium, and germanium. Its principal facilities were located at Lubumbashi, Likasi, Kolwezi, and Luilu in Shaba Province. The Kipushi Mine, west of Lubumbashi, was the source for zinc, cadmium, and germanium, as well as copper sulfides.

Gécamines' ore production from underground mines at Kamoto, Kambove, and Kipushi was over 6 million tons, about 280,000 tons greater than in 1982. A new gyratory crusher with 1,000 tons per hour capacity was installed at Kamoto. Copper ore grades were lower at Kambove and Kipushi, owing to deepening of the workings. Open pit mining operations continued to suffer from low utilization of earthmoving machinery, owing to parts shortages, diesel fuel supply interruptions, and insufficient staffing. Combined ore production and waste removed was 4 million cubic meters below the target of 37.5 million cubic meters. Waste stripping rates continued to lag ore removal rates.

Copper products produced by Gécamines included blister copper, black copper, leach cathodes, refined cathodes, and wire bar. Other products produced as byproducts of copper mining were cobalt cathode, cobalt flakes and granules, copper-germanium concentrate, zinc concentrate, zinc ingots, gold, silver, baghouse dusts from the Lubumbashi smelter containing lead, zinc, cadmium, and germanium, and cadmium rods. Blister copper was exported to Société Générale du Minière for refining by Métallurgie Hoboken-Overpelt SA (MHO), both of Belgium. MHO contracted to refine a minimum of 125,000 tons per year of blister copper for a 3-year period, with an option on additional blister copper over that amount. Gécamines retained the right to market excess blister to other refiners.

The consortium of eight Japanese companies involved with Sodimiza in mining and concentrating copper ore at the Musoshi and Kinsenda Mines, about 85 kilometers southeast of Lubumbashi, withdrew from the venture and sold its 80% share to the Government. The consortium was one of only three concessions granted by the Government for development of copper and cobalt in Zaire. Output was about 35,000 tons per year of copper contained in concentrates. Japan continued to purchase the concentrates produced, which were shipped through South African ports.

Table 4.—Zaire: Details of 1982 copper production, by area

(Thousand metric tons)

Area	Ore[1]	Concentrate	Copper content
MINE			
Western group:			
Open pits	7,924	--	369.0
Kamoto underground	2,727	--	112.2
Central group:			
Open pits	582	--	20.6
Kambove underground[e]	1,633	--	43.5
Kipushi underground[e] [2]	1,395	--	46.6
Sodimiza underground	1,140	--	38.0
Total	15,401	--	629.9
CONCENTRATOR			
Western group:			
Mutoshi	2,066	49	13.4
Kamoto	5,778	495	197.8
Dima	608	91	21.7
Kolwezi	3,946	631	153.5
Central group:			
Kambove	1,509	77	34.5
Kakanda	723	92	22.8
Kipushi	1,384	141	39.3
Sodimiza	[e]1,140	81	36.0
Total	17,154	1,657	[3]519.0

[e] Estimated.

[1] Gross weight.

[2] The Kipushi ore also contained 108,400 tons of zinc and the Kipushi concentrator produced 145,000 tons of zinc concentrate containing 82,100 tons of zinc.

[3] The total copper recovered by La Générale des Carrières et des Mines du Zaire in 1982 was 473,500 tons.

Source: La Générale des Carrières et des Mines du Zaire 1982 Annual Report.

Iron and Steel.—A financial plan for upgrading the Entreprise Siderurgique de Maluku was proposed. The action was considered premature and an external audit of the society was to be undertaken. Built in 1972, the plant's capacity of 250,000 tons per year of crude steel has not been attained. Output reached about 25,000 tons per year in 1977, but the plant was believed to have been inoperative in recent years.

Tin.—Société Minière de Kania (Somika), formed in 1981 as a subsidiary of Coframines (80%) and the Government of Zaire (20%), was to commence output shortly at Kania in Shaba Province. Exploratory drilling commenced in 1955, and in 1974, BRGM completed a study of the deposit. Reserves were 5,000 tons of cassiterite. Somika was to produce 800 tons per year of cassiterite yielding about 500 tons of metal, as well as byproduct columbite and tantalite concentrates. Smelting was to be done in Europe. Capital investment in Somika by Coframines and Caisse Centrale de Cooperation Economique of France was $12 million. A mobile jig valued at $1.5 million was ordered from Boxmag-Rapid of the United Kingdom.

NONMETALS

Diamond.—Zaire was estimated to have been the world's largest producer of diamond in 1983. Output was from two areas, Mbuji-Mayi and Tshikapa. Mbuji-Mayi was the main producing area, and mines were operated by the Société Minière de Bakwanga (MIBA). MIBA was 80% Government controlled and was managed by Société d'Entreprise et d'Investissements SA (SIBEKA) of Belgium.

MIBA's production amounted to 5,656,096 carats in 1982 compared with 5,753,568 carats in 1981. Ore grade declined mainly owing to the exhaustion of detrital deposits, and the company sought to resort to kimberlite mining and to the exploitation of the Mbuji-Mayi riverbed. MIBA financed a $10 million, 6-cubic-foot bucket ladder dredge, which it inaugurated in 1983. A second dredge was also planned. De Beers Consolidated Mines Ltd. of the Republic of South Africa, which had a 19% interest in SIBEKA, and SIBEKA each made $3 million loans to MIBA for improved power and production facilities.

Zaire recommenced marketing diamond production by MIBA through the Central Selling Organization (CSO) of De Beers Consolidated Mines. Zaire had withdrawn from the CSO in May 1981. In the interim, gem prices had declined and reportedly affected the operational level of the mines. Other buyers of mainly gem diamond who were permitted to set up buying offices in the vicinity of Tshikapa included the International Diamond Co. of the United Kingdom and Harry Winston Inc.

Sulfur (Sulfuric Acid).—Gécamines produced sulfuric acid for its copper leaching operations from its acid plant at Shituru, near Likasi. Feed material to the plant was byproduct sulfur from the roasting of zinc concentrates derived from the Kipushi Mine and imported sulfur. A new hot gas flue was installed and a 5-kilometer-long pipeline was imported to supply water to the zinc plant at Kolwezi. Gécamines awarded a turnkey contract to Sim-Chem Ltd. of the United Kingdom for a new sulfuric acid plant to replace the existing plant. Design capacity was to be 200 tons per day. Financing amounting to $4.5 million was funded by the European Economic Community.

MINERAL FUELS

The World Bank, through the IDA, loaned $4.5 million of a $5.3 million exploration and technical assistance project to be implemented by the Zairian Department des Mines et de l'Energie (DME). Part of the project included an airborne magnetic survey awarded to Exploration and Data Consultants Inc. and Kenting Earth Sciences Ltd. of Canada. The IDA credit to DME was for 50 years, with 10 years of grace and no interest charged, except for an annual charge of 0.5% on the undistributed balance and 0.75% on the distributed balance.

The Moanda Oil Co., a subsidiary of Cometra Oil Co. of Belgium, reported an average output of 21,412 barrels per day for the first half of 1983, compared with 21,498 barrels per day in the first half of 1982. A production loss of 240,000 barrels occurred in March owing to an unspecified accident.

The Société Zairo-Italienne de Raffinage (SOZIR) operated the country's sole petroleum refinery at Moanda using primarily imported crude oil. Domestically produced oil, all from offshore wells, had a high pour point, paraffin, and salt, and was nearly all exported for refining. SOZIR was considering possible modifications in the refinery to treat new domestic crude of acceptable quality. A $40 million loan request to the World Bank was planned for construction of a pipeline to carry oil produced by the Zaire Gulf Oil Co. to the refinery and to build an asphalt plant in Bas-Zäire.

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[1] Physical scientist, Division of Foreign Data.

[2] Financial Times (London). Zaire Devalues Currency by 80 Percent. No. 29,117, Sept. 12, 1983, p. 7.

The Mineral Industry of Zambia

By Thomas O. Glover[1]

The mineral industry of Zambia provided just under 95% of the country's foreign exchange earnings while maintaining its position as the world's fifth largest producer of copper after Chile, the United States, the U.S.S.R., and Canada. Zambia also was the world's second largest cobalt producer, exceeded only by Zaire, its neighbor to the north. Transportation costs for delivering copper and cobalt metals to world markets continued to be a large part of the total cost for Zambian copper and cobalt. Rail transportation was the only means to transport bulk products in this landlocked country. Rail transportation goes through the Republic of South Africa and other East African countries. Zambia utilizes two primary ports for exports of copper and cobalt, Dar es Salaam in Tanzania and Richards Bay in the Republic of South Africa. Production of refined copper fell 1.6% from that produced in 1982. A prolonged period of low copper prices adversely affected the mining industry. Export earnings stagnated, and because of this, maintenance and modernization of plants and mines were virtually terminated. Falling ore grades and a lack of skilled personnel are also adding to the difficulties of the mining industry.

The serious foreign exchange problem experienced this year was expected to carry over to next year. Much of Zambia's $2.5 billion debt had to be rescheduled. The country's currency (kwacha) was devalued by 35% against the U.S. dollar. Debt service as a percentage of total exports rose to above 45%. The International Monetary Fund approved assistance to Zambia of $324 million.[2] Zambia also benefited from a European Economic Community loan of $51.2 million for the rehabilitation of Zambia's mining industry. The African Development Bank loaned Zambia $26.65 million to improve the operating efficiencies of Zambia Consolidated Copper Mines Ltd. (ZCCM).

Much needed improvements to the Tanzania-Zambia Railway (Tazara) were planned after China decided to extend the grace period for repayment of the Tazara debt. Funds in Tanzanian and Zambian budgets slated for earlier repayment of the loan were freed for repair work on the line. China also agreed to suspend repayment obligations on a $5.6 million loan used to purchase locomotives for the Tazara and further pledged an additional $15 million to purchase spare parts and other needed supplies. New and improved rolling stock and rehabilitation of the track are key objectives in the modernization program. Zambia, in recent years, has directed up to one-half of its copper exports through South African ports, but after the modernization program, it plans to redirect more shipments over the Tazara to the port at Dar es Salaam.

PRODUCTION AND TRADE

Zambia's production of metallic copper (blister and anodes) decreased less than 1% during 1983 while the production of refined cobalt metal decreased approximately 2%. Copper ore milled in 1983 decreased 5% below that of 1982; however, the grade of the ore increased from 1.83% in 1982 to 1.91% in 1983. ZCCM production came from 10 underground and 7 open pit mines at the company's 7 producing divisions. Construction of the 1.9-kilometer trolley line out of the Nchanga open pit operation was completed and partly operational. Owing to financial constraints, work on the Nchanga cobalt ore concentrator project was restricted to the crusher area. The treatment of refractory copper ores (TORCO) plant, at the Nkana division, ceased operation in March, having reached the end of its economic life and having exhausted ore stocks. Owing to the adverse financial situation in Zambia, little or no work occurred on the Chambishi leach plant expansion phase two or on the Chambishi sulfuric acid plant.

The major countries receiving copper exports from Zambia, in order of decreasing tonnage, were Japan, France, Italy, the Federal Republic of Germany, India, and the United Kingdom. The value of exported electrolytic copper in 1983 was $848 million compared with $757 million in 1982.

Table 1.—Zambia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983[p]
METALS					
Cadmium metal	--	1	--	--	--
Cobalt:					
Mine output, metal content of concentrate	4,280	4,400	4,000	[r] [e]3,251	3,199
Metal	3,176	3,310	2,570	2,446	2,407
Copper:					
Mine output:					
Total content of ore	723,978	760,200	697,943	720,290	868,251
Recoverable content of concentrate	588,334	595,757	588,000	567,800	642,800
Leaching (electrowon including that in recoverable content)	132,037	124,768	122,171	130,875	118,975
Metal:					
Blister and anodes, Cu content[2]	582,082	609,935	560,565	584,680	[e]581,200
Refined	561,940	607,592	560,446	584,613	575,423
Gold[3] troy ounces	7,933	10,576	10,545	13,439	10,160
Iron ore: Magnetite	50	378	1,434	797	715
Lead:					
Mine output, metal content of ore	17,640	[e]13,900	17,152	21,240	25,865
Metal, smelter and refined[4]	12,758	10,047	9,866	14,645	14,572
Selenium, recoverable content of:					
Refinery muds kilograms	[e]45,000	[e]45,000	[5]48,703	[5]42,668	[5]42,752
Elemental, refined locally do	19,980	22,704	23,929	22,453	22,051
Silver[6] thousand troy ounces	914	764	714	887	933
Tin concentrate, gross weight	1	([7])	([7])	10	22
Zinc:					
Mine output, metal content of ore	46,600	31,985	40,557	51,967	55,163
Metal, smelter plus electrolytic	38,213	32,686	33,298	39,186	37,882
NONMETALS					
Cement, hydraulic thousand tons	200	160	144	154	155
Clays, building, unspecified do	[8]72	8,392	28	27	9
Feldspar	500	475	452	362	226
Gem stones:					
Amethyst kilograms	4,860	3,360	45,222	23,476	38,799
Emerald do	[e]400	--	--	--	17
Gypsum	138	--	--	--	--
Lime, hydraulic and quicklime thousand tons	250	182	201	185	193
Nitrogen: N content of ammonia	[e]20,000	19,600	17,800	27,200	27,800
Pyrite, gross weight	3,002	2,600	--	--	--
Sand, construction	[9]194,955	[9]196,797	276,522	365,437	182,752
Stone:					
Limestone thousand tons	416	515	499	427	511
Phyllite do	7	8	4	9	10
Miscellaneous (building)	[9]216,136	[9]335,147	302,401	4,338,653	193,625
Sulfur, elemental basis (produced as sulfuric acid):					
From pyrite	1,234	1,122	5	1,239	25,513
From copper ores	73,903	91,233	90,154	83,870	[e]79,525
Total	75,137	92,355	90,159	85,109	[e]105,038
Talc	--	258	921	271	1,313
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous thousand tons	599	569	527	604	453

See footnotes at end of table.

Table 1.—Zambia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982	1983[p]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum refinery products:[e]					
Gasoline thousand 42-gallon barrels	1,700	1,095	NA	NA	NA
Jet fuel do	400	365	NA	NA	NA
Kerosine do	220	365	NA	NA	NA
Distillate fuel oil do	2,830	2,190	NA	NA	NA
Residual fuel oil do	1,400	2,190	NA	NA	NA
Other do	110	--	NA	NA	NA
Refinery fuel and losses do	128	365	NA	NA	NA
Total do	6,788	6,570	NA	NA	NA

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through July 23, 1984.

[2] Includes leach cathodes.

[3] Primarily contained in blister copper and refinery muds.

[4] For all practical purposes, Zambian output of crude lead and refined lead are regarded as equal; the latter is reported, and inasmuch as no impure lead is marketable, no attempt had been made to estimate the trivial difference between the two stages of processing.

[5] Selenium output for fiscal year ending on March 31, includes elemental selenium recovered from exported refinery muds by overseas refiners amounting to 24,774 kilograms in 1981, 20,215 kilograms in 1982, and 20,701 kilograms in 1983.

[6] Refined silver and silver contained in blister copper and refinery muds.

[7] Less than 1/2 unit.

[8] Converted from figure reported in cubic meters; believed to represent only a small part of total output.

[9] Figure for 1979 reported as cubic meters, but that for 1980 reported as metric tons; it is believed that both figures actually represent metric tons.

Table 2.—Zambia: Copper production and ore reserves of Zambia Consolidated Copper Mines Ltd. in 1983, by mine

Mine	Ore mined and treated			Ore reserves		
	Gross weight (thousand metric tons)	Copper grade (percent)	Copper recoverable in copper concentrate (percent)	Gross weight (thousand metric tons)	Copper grade (percent)	Cobalt (percent)
Baluba[1]	2,239	1.67	89.31	53,754	2.55	0.17
Bwana Mkubwa[2]	420	2.26	70.20	53	3.53	--
Chambishi[1]	2,795	1.50	94.18	26,270	2.77	--
Chibuluma[1]	671	3.19	96.36	7,222	3.64	.22
Kansanshi[2]	--	--	--	3,791	2.81	--
Konkola[1]	1,922	2.94	85.93	55,361	3.77	.08
Luanshya[1]	3,921	1.33	92.00	44,270	2.44	--
Mufulira[1]	5,612	1.96	92.97	95,089	3.06	--
Nchanga[1 2]	9,927	2.84	64.36	129,565	3.78	.73
Nkana[1]	3,937	1.51	91.01	81,848	2.39	.13
Nkana[2]	546	1.54	67.88	--	--	--
Grand total or average	31,990	2.12	82.50	497,223	3.10	.16

[1] Underground.

[2] Open pit.

Source: Zambia Consolidated Copper Mines Ltd. 1983 Annual Report.

COMMODITY REVIEW

METALS

Copper, Cobalt, Byproduct Gold, Selenium, and Silver.—ZCCM treated approximately 30.4 million tons of ore yielding about 575,400 tons of electrolytic copper. Ore reserves as published in the ZCCM annual report for the year ending March 31, 1983, were estimated at 15,414,000 tons of contained copper and 795,560 tons of contained cobalt.

The Nchanga division was ZCCM's biggest copper producer and has operated the largest open pit copper mine in Zambia since 1939. Construction of a 1.9-kilometer trolley line out of this open pit operation was completed, and test runs were used to power haulage trucks out of the pit. Work on the cobalt ore concentrator was restricted to the crusher area owing to financial constraints. A horizontal belt filter at the tailings leach plant was installed.

The Mufulira division's production comes from one of the world's largest underground copper mines. Its metallurgical operations span concentrating, smelting, and refining. At the Ndola copper refinery, which was administered by the Mufulira division, there was also a precious metals plant. The plant recovers gold, silver, and selenium from anode slimes recovered at all of ZCCM's refineries. The Mufulira Mine has been in production since 1933. In 1983, ore production was below the scheduled rate because of insufficient drilled reserves, poor loader availability because of spare parts shortages, and intermittent problems with the underground plant.

Operations at the precious metals plant were satisfactory, and all recovered slimes were accepted for treatment. The selenium removal process continued to be a constraint, and a significant proportion of the total output was exported as decopperized slimes. Total production from slimes was 42,800 kilograms of selenium, 1,151,208 troy ounces of silver, and 17,366 troy ounces of gold. Minor quantities of platinum and palladium were also recovered. In addition, 102,958 troy ounces of silver was recovered from Kabwe lead-zinc ore.

The Nkana division commenced production in 1932. The Nkana underground copper mine was the deepest of ZCCM mines with two shafts extending to 1,200 meters. There are three open pit operations in the division, which includes the Bwana Mkubwa Mine. Nkana's 1983 cobalt production capacity was increased with the construction of a new plant. The older cobalt plant at Nkana was shut down after the new one commenced operations. Total production capacity of ZCCM's two remaining cobalt plants is 5,000 tons.

The Luanshya division has the oldest and newest operating underground mines on the Copperbelt. Luanshya was the oldest; Baluba, the newest. At Luanshya, underground exploration drilling continued in two areas to establish the structural configuration of the ore body in complex geologic areas. At Baluba, underground exploration drilling was confined to drilling into the north limb. During the year, the equipping of the Baluba No. 2 shaft was completed.

The Kalulushi division comprises the Chibuluma and Chambishi Mines. Operation at Kalengwa, which commenced in 1969, ceased during the year. At Chibuluma, the deteriorating state of the old filter plant was a constraint on production. A new filter plant was built with three new filters installed. A third ball mill was installed at the Chibuluma concentrator to enable higher production schedules. The Chambishi underground expansion, involving off shaft development below the 500-meter level, was reactivated.

Lead, Zinc, and Byproduct Cadmium.—Ore hoisted at the Kabwe Mine totaled 228,892 tons at grades of 11.3% lead and 24.1% zinc. Byproduct cadmium was produced in very small amounts. The Kabwe Mine first produced zinc in 1906. Its other product was lead, with silver as a byproduct. The Kabwe division includes the Nampundwe Mine and concentrator near Lusaka, where copper and pyrite concentrates are produced. Ore hoisted at the Nampundwe Mine in 1983 totaled 61,608 tons at grades of 15.5% sulfur and 1.10% copper. Work on the Nampundwe expansion project, which included replacement of the ore hoist and upgrading the concentrator, was completed.

NONMETALS

Fertilizer Materials.—A new 60,000-ton-per-year sulfuric acid plant was completed in Kafue, 60 kilometers south of the capital city of Lusaka. The product was used to turn out ammonium sulfate fertilizer. An operational ammonium nitrate fertilizer plant built in 1970 is adjacent to the new acid plant.

Gem Stones (Amethyst, Emerald, and Tourmaline).—Two mines produced emeralds during the year, privately owned Nkuralu and Co.'s Kamakanga Mine and the state-owned Fwayafwaya Mine owned by the Reserve Minerals Corp. Only 17 kilograms of emeralds valued at $204,785 was produced legally in Zambia. Only an estimated 10% of Zambia's emeralds is legally mined. Amethyst and tourmaline are also mined in Zambia. Value of amethyst and tourmaline production for the year exceeded $13.4 million.

MINERAL FUELS

Coal.—Production of coal at the Maamba Collieries decreased 25% from that of 1982 to 452,867 tons. The International Bank for Reconstruction and Development's (World Bank) International Development Association loaned Zambia $4.3 million for Maam-

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ba Collieries. The loan was used for technical and economic feasibility studies, procurement of spare parts, and training. Total cost of the program was $6.1 million. Foreign exchange was unavailable to purchase much needed larger new equipment or spare parts for the larger old equipment.

Petroleum.—A multimillion dollar oil prospecting operation in the Western Province and the Luangwa Valley was undertaken by two international companies at a cost of $5.3 million. An initial aerial photogeological interpretation survey was conducted as part of the feasibility studies. The Zambian Geological Survey supervised the operations.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, Zambian kwachas (K) have been converted to U.S. dollars at the rate of K1=US$0.7996.

The Mineral Industry of Zimbabwe

By George A. Morgan[1]

The mineral industry experienced mixed results in 1983, reflecting both changing world demand for minerals produced in Zimbabwe and local industry mining conditions. The value of all minerals produced was $423.4 million compared with $413.7 million in 1982 and $548.7 million in 1981.[2] The weakness of the Zimbabwe dollar was reflected in the exchange rate and was partly a result of a 20% devaluation that occurred in late 1982. Contraction of the domestic mining industry continued with closure of several mines, including the Empress nickel mine, Mitmar (Pvt.) Ltd.'s mica mines, and several chromite mines on the Great Dyke. High operating costs, mainly from wages and utilities, and low metal prices were the contributing factors to these closures. Exhaustion of reserves forced the closure of the Perserverance nickel mine in late 1982, and the Shackleton and Angwa copper mines were under study for possible closure.

Exploration for new copper and nickel ore bodies in 1983 was virtually nil, although uranium exploration was underway in the northwest. Active gold mining companies continued to search for nearby reserves in well-established gold mining areas. Gold mining remained the most active sector in the industry.

Government Policy and Programs.—The Government established the Zimbabwe Mining Development Corp. to provide financial support both for exploration and mine development. The Minerals Marketing Corp. functioned as the Government's marketing agency for all minerals and mineral products produced in Zimbabwe, excluding gold.

PRODUCTION

The index of volume of crude mineral production for 1983 was 163.2, compared with 168.1 in 1982 (1964=100). The volume of processing of mineral products in the manufacturing sector in the 11-month period ending November 1983 was 239.0 compared with 252.0 in 1982 for nonmetallic mineral products, and 285.6 in 1983 compared with 280.8 in 1982 for metals and metal products. Output of gold, silver, coal, and iron ore increased, and output of asbestos, cobalt, copper, and nickel declined. Chromite output was relatively unchanged.

Table 1.—Zimbabwe: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982^{p}	1983^{e}
METALS					
Aluminum: Bauxite, gross weight	5,076	4,281	5,139	7,533	7,500
Antimony, mine output, metal content[2]	87	83	145	206	220
Arsenic, white	--	79	21	--	--
Beryllium: Beryl concentrate, gross weight	28	9	42	52	50
Cesium minerals: Pollucite	--	88	^{e}100	^{e}80	50
Chromium: Chromite, gross weight thousand tons	542	554	536	432	431
Cobalt:					
Mine output, recoverable metal content^{e}	210	120	100	100	73
Metal (including content of refinery sludges)	204	115	94	98	73
Columbium and tantalum: Tantalite concentrate:					
Gross weight kilograms	30,000	41,000	45,000	36,000	36,000
Columbium content^{e} do.	3,175	4,500	6,800	^{r}5,400	5,400
Tantalum content^{e} do.	8,160	10,400	15,900	^{r}12,600	12,600
Copper:					
Mine output, metal content	29,600	^{r}26,901	24,583	24,693	20,900
Metal:[3]					
Smelter, primary^{e}	28,500	26,100	23,000	23,200	19,600
Refinery, primary^{e}	3,000	3,100	8,000	23,000	19,000
Gold, mine output, metal content thousand troy ounces	^{r}386	^{r}367	371	426	453
Iron and steel:					
Iron ore:					
Gross weight thousand tons	1,201	1,622	1,096	837	924
Metal content^{e} do.	721	973	660	500	555
Metal:					
Pig iron^{e} do.	600	600	400	250	700
Ferroalloys:					
Ferromanganese	^{e}2,400	^{e}2,400	2,000	2,123	1,500
Ferrochromium	^{e}200,000	^{e}260,000	209,072	$^{r\ e}$190,000	140,000
Total	^{e}202,400	^{e}262,400	211,072	$^{r\ e}$192,123	141,500
Steel, crude thousand tons	740	804	600	528	550
Nickel:					
Mine output, metal content	14,591	15,075	13,018	13,309	9,949
Metal, smelter^{e} [4]	13,200	14,100	^{r}12,000	^{r}12,000	9,150
Platinum-group metals:					
Platinum troy ounces	--	2,990	2,300	1,704	1,200
Palladium do.	--	6,784	5,200	2,765	2,000
Total do.	--	9,774	7,500	4,469	3,200
Silver, mine output, metal content thousand troy ounces	^{r}977	949	857	918	935
Tin:					
Mine output, metal content^{e}	1,340	1,300	1,600	^{r}1,660	1,700
Metal, smelter	967	934	1,157	1,197	1,235
Tungsten, concentrate output:					
Gross weight	224	194	119	67	50
Metal content^{e}	110	90	55	30	25
NONMETALS					
Abrasives: Natural corundum	16,628	18,681	12,202	8,714	8,700
Asbestos thousand tons	^{r}260	251	248	194	153
Barite	449	195	--	800	800
Cement, hydraulic thousand tons	396	469	550	^{e}400	400
Clays:					
Bentonite (montmorillonite)	54,320	69,153	78,403	85,490	85,000
Fire clay	16,745	17,005	14,658	11,746	12,000
Kaolin	2,686	4,450	4,657	2,442	2,500
Feldspar	1,085	1,263	2,393	666	700
Gem stones, precious and semiprecious:[5]					
Amethyst kilograms	3,228	4,001	NA	NA	NA
Garnet do.	^{r}31	^{r}25	NA	NA	NA
Topaz do.	--	--	NA	NA	NA
Tourmaline do.	6	5	NA	NA	NA
Graphite	5,736	7,385	11,218	8,225	8,000
Kyanite	--	716	870	2,207	2,500
Lithium minerals, gross weight	13,197	^{r}19,942	16,444	9,787	5,000
Magnesite	84,495	78,217	60,194	60,660	60,000
Mica	1,275	1,022	1,406	861	400
Nitrogen: N content of ammonia thousand tons	^{e}60	57	52	84	71
Phosphate rock, marketable concentrates do.	136	130	122	122	120
Pigments, iron oxide^{e}	500	1,000	1,200	1,000	1,000
Pyrite, gross weight thousand tons	66	68	65	58	60
Quartz[6] do.	144	166	142	669	600
Stone: Limestone do.	1,057	1,218	1,409	1,270	1,300

See footnotes at end of table.

Table 1.—Zimbabwe: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	1981	1982^p	1983^e
NONMETALS —Continued					
Sulfur:					
S content of pyrite thousand tons	28	29	25	25	25
Byproduct of coal and metallurgy^e do.	5	5	5	5	5
Total^e do.	33	34	30	30	30
Talc	1,170	456	386	270	270
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous thousand tons	3,188	3,134	2,867	2,769	3,236
Coke, metallurgical[7] do.	201	235	200	^{e}200	200

^{e}Estimated. ^{p}Preliminary. ^{r}Revised. NA Not available.

[1] Table includes data available through May 15, 1984.

[2] Content of concentrates.

[3] Smelter copper includes impure cathodes produced by electrowinning in nickel processing. Output of fire-refined copper by Messina (Transvaal) Development Corp. apparently was terminated in 1972. Refined copper output from that date to 1980 includes only electrolytic copper output by Corsyn Consolidated Mines Ltd. at the Inyati Mine. Output in subsequent years includes electrolytic copper from the new refinery at Mangula.

[4] Includes Ni content of nickel oxide and nickel fonte.

[5] Other gem stones produced are as follows, in kilograms: 1981—beryl, 327, and chrysoberyl, 2; and 1982—beryl, 1,080, and aquamarine, 36.

[6] Includes rough and ground quartz as well as silica sand. Quartz crystal was also produced in the amount of 3 metric tons in 1979.

[7] Data represent output by the Wankie Colliery for years ending Aug. 31 of that stated; additional output by the Radcliff plant of Risco Ltd. may total 250,000 metric tons per year of metallurgical coke and coke breeze.

TRADE

Trade data for only the first 6 months of 1983 were available. Total mineral exports in that period were $244 million, about 49% of all exports. Gold sales comprised $57 million of the total. Exports of coal, cement, gem stones, lithium, copper, and nickel were up, but exports of iron and steel products, the largest metal industry in the country, declined.

Total mineral-related imports in the same 6-month period were valued at $158 million, including nearly $11 million for electricity, or about 30% of all imports. Mineral fuels accounted for $113 million of total imports. Over $70 million in petroleum products was shipped via the Republic of South Africa.

The major export and import trading partners were the Republic of South Africa, the United Kingdom, the Federal Republic of Germany, and the United States. Railroad transport for landlocked Zimbabwe was the principal means of mineral conveyance. Turnaround time for a railcar traveling between Bulawayo and Maputo averaged 45 days, and turnaround time between the Zimbabwe border and Beira took up to 30 days.

Table 2.—Zimbabwe: Apparent exports of mineral commodities[1] [2]

(Metric tons unless otherwise specified)

Commodity	1981^r	1982
METALS		
Antimony: Ore and concentrate	26	NA
Columbium and tantalum: Metal including alloys, all forms: Tantalum[3] value, thousands	$2,031	$211
Copper: Metal including alloys, all forms[3]	17,943	22,661
Gold: Metal including alloys, unwrought and partly wrought [3] value, millions	$106	$153
Iron and steel: Metal:		
Pig iron, cast iron, related materials[3]	10,195	5,001
Ferroalloys: Unspecified[3]	220,575	182,634
Steel, primary forms[3]	207,827	252,525
Semimanufactures:		
Bars, rods, angles, shapes, sections[3]	118,402	86,791
Universals, plates, sheets	693	NA
Rails and accessories[3]	1,397	2,593
Wire[3]	18,167	8,438

See footnotes at end of table.

Table 2.—Zimbabwe: Apparent exports of mineral commodities[1] [2] —Continued

(Metric tons unless otherwise specified)

Commodity	1981[r]	1982
METALS —Continued		
Lithium: Ore and concentrate[3]	16,163	9,793
Nickel:		
Matte and speiss	159	NA
Metal including alloys, all forms[3]	11,685	11,974
Platinum-group metals: Metals including alloys, unwrought and partly wrought, unspecified value, thousands	$6	NA
Silver:		
Ore and concentrate[3] [4] do	$1,068	$352
Waste and sweepings[4] do	[3]$7,834	NA
Tin: Metal including alloys, all forms[3]	950	1,030
Tungsten: Ore and concentrate[3]	130	52
Other:		
Ores and concentrates[3]	1,068	352
Ashes and residues	251	NA
Base metals including alloys, all forms	4	--
NONMETALS		
Abrasives, n.e.s.:		
Natural: Corundum, emery, pumice, etc	18	NA
Asbestos, crude[3]	198,958	168,812
Cement[3]	46,584	49,171
Diamond: Gem, not set or strung value, thousands	$59	NA
Feldspar, fluorspar, related materials	412	NA
Graphite, natural	70	NA
Magnesium compounds: Magnesite[3] value, thousands	$1,207	$1,294
Precious and semiprecious stones other than diamond: Natural[3] do	$2,390	$3,210
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	79	NA
Worked	27	NA
Gravel and crushed rock	97,453	NA
Quartz and quartzite	75	NA
Talc, steatite, soapstone, pyrophyllite value, thousands	$7	NA
Other: Crude	1,212	NA
MINERAL FUELS AND RELATED MATERIALS		
Coal: All grades including briquets[3]	116,357	66,217
Coke and semicoke[3]	112,921	128,221

[r] Revised. NA Not available.

[1] Table prepared by Virginia A. Woodson.

[2] Owing to a lack of official trade data published by Zimbabwe, this table should not be taken as a complete presentation of this country's mineral exports. These data have been compiled from various sources, which include United Nations information, data published by the partner trade countries, and partial official trade data of Zimbabwe. Unless otherwise specified, data are compiled from official trade statistics of individual trading partners.

[3] Monthly Digest of Statistics. Jan. 1984, Central Statistical Office, Harare, Zimbabwe.

[4] May include other precious metals.

Table 3.—Zimbabwe: Apparent imports of mineral commodities[1] [2]

(Metric tons unless otherwise specified)

Commodity		1981[r]	1982
METALS			
Alkali and alkaline-earth metals: Unspecified		2	--
Aluminum:			
Oxides and hydroxides		74	NA
Metal including alloys:			
Unwrought		1,917	NA
Semimanufactures[3]	value, thousands	$8,980	$4,850
Chromium: Oxides and hydroxides		40	NA
Copper: Metal including alloys:			
Unwrought		119	NA
Semimanufactures		117	NA
Iron and steel: Metal:			
Pig iron, cast iron, related materials		51	NA
Ferroalloys, unspecified[3]	value, thousands	$1,668	$373
Steel, primary forms		10,805	NA
Semimanufactures:			
Bars, rods, angles, shapes, sections[3]	value, thousands	$6,295	$5,195
Universals, plates, sheets[3]	do	$28,954	$27,468
Hoop and strip		100	NA
Rails and accessories[3]	value, thousands	$5,975	$3,195
Wire		812	NA
Tubes, pipes, fittings[3]	value, thousands	$5,444	$9,023
Lead: Oxides		36	NA
Manganese: Ore and concentrate, metallurgical-grade		70	NA
Nickel:			
Ore and concentrate including matte[3]	value, thousands	$779	$7,489
Metal including alloys, semimanufactures		17	NA
Silver: Metal including alloys, unwrought and partly wrought	value, thousands	$26	NA
Tungsten: Metal including alloys, all forms	kilograms	430	NA
Uranium and/or thorium: Ore and concentrate	value, thousands	$140	NA
Zinc:			
Oxides		785	NA
Metal including alloys, all forms[3]	value, thousands	$2,217	$2,160
Other: Base metals including alloys, all forms	do	$28	NA
NONMETALS			
Abrasives, n.e.s.: Grinding and polishing wheels and stones		23	NA
Boron materials:			
Crude natural borates		522	NA
Oxides and acids		41	NA
Cement		(4)	--
Chalk		54	NA
Diamond: Gem, not set or strung	value, thousands	$39	NA
Fertilizer materials:			
Manufactured:			
Ammonia[3]	value, thousands	$6,755	$9,327
Nitrogenous[3]	do	$13,928	$8,157
Phosphatic		7,707	NA
Potassic	value, thousands	[3]$12,559	NA
Unspecified and mixed	do	--	[3]$8,987
Graphite, natural		5	--
Gypsum and plaster		56	--
Magnesium compounds: Magnesite		(4)	--
Mica: Worked including agglomerated splittings		1	--
Precious and semiprecious stones other than diamond:			
Natural	value, thousands	$75	NA
Synthetic	do	$16	NA
Salt and brine[3]	do	$1,375	$1,311
Sodium compounds, n.e.s.: Sulfate, natural and/or manufactured	do	[3]$2,504	NA
Sulfur: Elemental, crude including native and byproduct[3]	do	$2,194	$2,415
Other: Crude		33	NA
MINERAL FUELS AND RELATED MATERIALS			
Carbon: Carbon black		58	NA
Coal: All grades including briquets and coke[3]	value, thousands	$2,336	$2,711
Petroleum:			
Crude[3]	do	$273,470	$154,755
Refinery products:			
Liquefied petroleum gas	42-gallon barrels	174	NA
Gasoline	do	77	NA
Mineral jelly and wax	do	7,713	NA
Distillate fuel oil	do	52	NA
Lubricants	do	3,974	NA

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[r] Revised. NA Not available.

[1] Table prepared by Virginia A. Woodson.

[2] Owing to a lack of official trade data published by Zimbabwe, this table should not be taken as a complete presentation of this country's mineral imports. These data have been compiled from various sources, which include United Nations information, data published by the partner trade countries, and partial official trade data of Zimbabwe. Unless otherwise specified, data are compiled from official trade statistics of individual trading partners.

[3] Monthly Supplement to the Digest of Statistics. Jan. 1984, Central Statistical Office, Harare, Zimbabwe.

[4] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Chromite.—Depressed world steel consumption and increased local costs for electricity and labor caused reductions in the production of chromite and ferrochrome by Zimbabwe's two chromium producers.

Zimbabwe Mining and Smelting Co. (ZIMASCO), a Union Carbide Corp. subsidiary, operated only four of six electric furnaces for production of mainly high-carbon ferrochrome. Despite the lowered operational level, stockpiles of chromite and ferrochrome reportedly created liquidity problems early in the year. ZIMASCO expected to reactivate a 18-megavolt-ampere furnace, idled for nearly 2 years, to increase capacity for production of high-carbon ferrochrome to 150,000 tons per year from 120,000 tons.

Zimbabwe Alloys Ltd. (Zimalloys), an Anglo American Corp. Ltd. subsidiary, reduced both mine and mill operations. Total power consumption to the Gweru refinery was halved, mainly in response to poor market conditions and increased costs. In the past 2 years, Zimalloys electricity costs were raised 88%, or $4.5 million. The latest increase by the Electric Supply Commission would add an additional $5 million to the cost of power. High interest rates also severely impacted Zimalloys, which was financing a $56.6 million stockpile. It was granted a $12 million Government loan for 5 years, with the Government having the right to convert debt to equity to a maximum of 19.35% of Zimalloys. No dividend payments were permitted until repayment of the loan. The company reported a loss of $10 million in the 6-month period ending September 30.

Zimalloys shut down its 28-megawatt high-carbon ferrochrome furnace in its plant at Gweru. It closed the Caesar Mine, completing removal of all underground equipment at the end of March. Operations at the No. 4 complex of the Sutton Mine were put on care and maintenance while production continued in the No. 1 complex. Output at the Vanad Mine was reported down owing to labor inefficiencies as well as power failure and a mine accident. The Netherburn Mine improved in terms of tonnage and grade, and the concentrator was contributing 450 tons per month to the refinery. Two new shafts were being sunk and housing improvements were being made. The phase-one exploration program at the Rhonda Prospect was completed and reported as not promising. In the year ending March 31, 1983, Zimalloys total work force was cut by 775, including 636 in the mining division and 139 at the refinery.

Cobalt.—Byproduct cobalt production by Rio Tinto (Zimbabwe) Ltd. ceased with closure of both the Empress Mine, a primary nickel producer, and the company's smelter and refinery at Eiffel Flats. The closure left Bindura Nickel Corp. Ltd. (BNC) as the sole producer of cobalt at less than 100 tons per year.

Copper.—M.T.D. (Mangula) Ltd., which incorporated Mangula Mines and Lomagundi Smelting and Mining Co., accounted for about 90% of the copper and 70% of the silver produced in Zimbabwe. The company's cathode production was 18,699 tons in 1983 compared with 17,571 tons in 1982. Production of anode slimes was 41.5 tons. The slimes, containing 772,000 troy ounces of silver and 9,000 troy ounces of gold, were exported. Continued increases in electric rates were making mining operations unprofitable, and high interest rates and lack of access to foreign exchange prevented replacement of parts and equipment. Startup of the Copper Queen Mine was postponed because of uneconomic conditions mainly owing to the low price of copper and high electric costs. The mine, in which Mangula had already invested over $1 million, would require installation of powerlines and was to have produced lead and zinc as the main byproducts.

The principal copper mine in Zimbabwe was the Mangula Mine, which remained profitable. Mine output by the Miriam and Norah Mines was 1,749,000 tons with a combined grade of 0.93% copper. The Miriam concentrator had a throughput of 1,257,000 tons grading 0.96% copper. Merits Ltd., which operated the Shackleton and Angwa Mines, was 25% held by Mangula. A loss of $2 million was declared on the two mines, and they were being considered for possible closure.

Corsyn Consolidated Mines Ltd., a wholly owned subsidiary of Coronation Syndicate Ltd., reported improved output for the year ending September 30, 1983. Total copper output was 2,970 tons compared with 2,453 tons in 1982. Total throughput at the company's four mines declined by 10,000 tons but ore grades were higher. A small working profit was reported at the Inyati Mine, the company's primary copper producer, compared with a loss in 1982 of $2.9 million. Efforts were underway at Inyati to establish a plant for silver recovery from tankhouse slimes.

Gold.—Falcon Mines PLC had a total output of 47,834 troy ounces of gold at yearend 1983, down from that of 1982. The main cause of the reduction was a maintenance shutdown in October. Problems were also experienced in the roaster and cyanide circuits, leading to a higher than expected concentrate stockpile. The Dalny Mine had a mill throughput of 169,271 tons yielding 0.207 troy ounce per ton. Mill throughput at the Venice Mine was 91,386 tons, and gold yield was 0.1395 troy ounce per ton. Olympus Consolidated Mines Ltd., a subsidiary of Falcon, continued development of the Dawn and Commoner Mines. Financing for the development was from the Old Nic Mine. The Golden Oriole Mine experienced mill problems as well as poor feed grade, but secondary development on levels 2 and 5 was producing increased tonnages of payable ore.

Falconbridge Investments (Zimbabwe) (Pvt.) Ltd., formerly Blanket Mine (Pvt.) Ltd., recommenced production at the Golden Kopje Mine on December 1 after a 1-year postponement owing to low gold prices and technical difficulties. The mine was 22 kilometers southwest of Chinhoyi and had a mill rate of 6,000 tons per month. Employment at the new mine was 214 people. The ore bodies at the Golden Kopje Mine were lenticular sulfide zones in an iron formation 20 to 50 meters wide. The country rock footwall was composed of talc, chlorite, and sericite schists, and chlorite schist predominated in the hanging wall. Mine production was via a 165-meter-deep vertical shaft using 1-ton skips on twin hoists. Mining was by underhand stoping with handheld rock drills. A three-stage crushing plant reduced ore to 92% minus 200 mesh and was followed by flotation, amalgamation, cyanidation, and zinc precipitation. The company also produced about 20,000 troy ounces of gold from the Blanket Mine.

Corsyn Consolidated produced 51,087 troy ounces of gold in the year ending September 30, 1983, compared with 50,155 troy ounces in 1982. Output was mainly from the Arcturus, Mazowe, and Muriel Mines. Production at Arcturus Mine included 9,000 tons of tailings from the Mashona Kop Mine as well as ore mined from the newly commissioned Viceroy Mine.

Iron and Steel.—The Government of Zimbabwe approved a $180 million program of revitalization for the country's sole iron and steel producer, the Zimbabwe Iron and Steel Co. (ZISCO), in which it had about 50% control. The Government also intended to make up any cash shortfalls for ZISCO during the 3- to 5-year life of the program.

Expenditures included $95 million for a long-planned sintering plant to treat Ripple Creek Mine ore at Redcliff, $50 million for two continuous casters, $17 million for quality control systems and specialty steel products, and $6 million for modernization of light section plants.

ZISCO temporarily shut down its only operational furnace in April for emergency repairs. The furnace had 2,000 tons per day of pig iron capacity. The No. 3 furnace was down for several months owing to the unavailability of imported refractory brick for relining, and had a capacity of 800 tons per day. By yearend, ZISCO had both furnaces on-line and producing 80,000 tons per month of pig iron. Voest-Alpine AG, Austria, provided about 25 technicians to ZISCO following the loss of experienced staff owing to reorganization and wage freezes.

Lancashire Steel (Pvt.) Ltd., a subsidiary of British Steel Corp., continued to have severe financial difficulties and reportedly was losing $180,000 per month, owing to high costs and declining markets. The company produced rod and wire from billets purchased from ZISCO.

Nickel.—Consolidation of nickel mining and processing facilities in Zimbabwe occurred with the closure of the Eiffel Flats nickel smelter and refinery of Rio Tinto in August 1983, with a capacity of 9,000 tons per year of refined metal. The closure left operational a single refinery at Bindura with a capacity of 15,000 tons per year of refined metal. Prior to closure, feed to the plant was limited quantities of imported nickel-copper matte from Botswana. The company's domestic nickel mining operations and smelter feed ceased with the closure of the Empress Mine at yearend 1982 owing to high operating costs. It had closed the Perserverance Mine in 1980 following exhaustion of ore reserves.

BNC took over the financially weak Shangani Mining Corp. Ltd. by exchanging one BNC share for five Shangani shares. A wholly owned subsidiary of BNC purchased the mine assets of Shangani for $20 million. BNC thus became the sole primary nickel producer in Zimbabwe, operating four mines: the Shangani Mine at Insiza, the

Trojan Mine at Bindura, the Epoch Mine at Filabusi, and the Madziwa Mine north of Shawa. Concentrates were sent to Bindura Smelting and Refining Ltd., Bindura. BNC had a net loss of $9 million in 1983. Sales were higher at 12,400 tons mainly owing to a 30% depreciation of the currency. Johannesburg Consolidated Investments Co. Ltd. had 8.7% equity in BNC and Anglo American had about 40% equity in BNC.

Tin.—Kamativi Mine, operated by Kamativi Tin Mines Ltd., which was 91% owned by the Industrial Development Corp. (IDC) of Zimbabwe, reported losses in the year ending June 30, 1983. IDC granted the company a loan of $6 million to cover losses and expenditures for capital improvements. Production costs reportedly exceeded the market price for tin. The implementation of new drilling and ore loading technology improved ore extraction, reduced time spent on stoping preparation, and reduced labor requirements and mining costs.

NONMETALS

Asbestos.—The IDC reported the closure of the DSO Mine near Mashaba owing to exhaustion of dump material that was being worked by a tributer.

Cement.—United Portland Cement Co. (Pvt.) Ltd., a locally owned firm, continued to operate its limestone kilns at Coleen Bawn and Bulawayo at 50% capacity, or about 200,000 tons per year. Export sales were up compared with those of 1982, mainly a result of lack of local demand. Exports were 56,000 tons for the 8-month period ending August. The company also owned 51% of Fort Concrete (Pvt.) Ltd., in Gwelo, which supplied prestressed concrete sleepers to the Zambian Railway and the National Railway of Zimbabwe.

Fertilizer Materials.—Local consumption of nitrogen fertilizer was estimated at about 240,000 tons per year. Sable Chemical Industries at Que Que was the sole producer, supplying about 200,000 tons per year; the remainder was imported. A barter transaction with Romania involved the exchange of about 1,000 tons of ferrochrome for 25,000 tons of urea. Sable Chemical Industries' power requirement for hydrogen generation and ammonia production were severely impacted by increased electricity rates. Price increases of 15% for phosphate fertilizer and 20% for nitrogen fertilizers were expected.

Mica.—Mitmar (Pvt.) Ltd., the country's sole producer of flake and scrap mica, reportedly ceased production owing to rising labor costs in the labor-intensive industry. Output had been as high as 7,000 tons per year in 1971, but had declined to less than 1,000 tons in 1983.

Stone.—*Building.*—The IDC owned 47.5% of Quarrying Enterprises (Pvt.) Ltd., which mined small quantities of black granite from the Mutako area. Transport difficulties were being overcome to boost production for the export market.

MINERAL FUELS

Coal.—Hwange colliery expansion was completed by Wankie Colliery Co. Ltd., which was 40% owned by the Zimbabwean Government. Utilization of the new coal output was dependent upon full startup of the thermal power station recently completed at Hwange. Scheduled startup was December 1982, but was postponed owing to unspecified reasons. Coal output averaged 230,000 tons per month, of which 180,000 tons was from opencast mines. The new powerplant was to consume 30,000 tons per month from opencast operations. Coal reportedly was exported to Zaire, Zambia, Mozambique, and Tanzania.

Coke output by Wankie was limited to 19 of 32 ovens owing to oven breakdown, yielding about 11,000 tons per month of coke. ZISCO, the main user of coke for the reduction of iron ore, consumed 65,000 tons of coal per month for production of coke at its own plant in Que Que.

Coal and coke prices increased 10% in April, and a further increase for coke was expected. The price increases were part of the financing agreement for the new thermal powerplant and an expanded production facility at Hwange. At yearend, the company decided not to pay its annual dividend in order to help finance loan payments and interest coming due in 1984 of $19 million.

Petroleum.—Zimbabwe produced no crude oil or natural gas, nor did it refine imported crude oil. All liquid fuel imports were in the form of refined products shipped by pipeline via Beira in Mozambique to Umtali in Zimbabwe, or by tanker via the Republic of South Africa.

Owners of the pipeline were the Lonrho Investment Group, Da Cunha Co., and the Mozambique Government. A new company, the National Oil Co. of Zimbabwe, was formed to take over operation of importing and storing petroleum products, functions currently performed by private companies.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Zimbabwean dollars (Z$) to U.S. dollars at the rate of Z$1.00=US$1.3944 in 1981, Z$1.00=US$1.08 in 1982, and Z$1.00=US$0.90 in 1983.

The Mineral Industry of Other Central African Countries

By Thomas O. Glover[1]

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CAMEROON

The mining industry of Cameroon continued to be dominated by crude petroleum. Crude petroleum production has become the most important facet of Cameroon's economic development. Oil production was estimated to be 6.3 million tons in 1983 compared with 5.2 million tons in 1982 and 4.3 million tons in 1981. Over two-thirds of its export income was attributed to crude oil. The country's only refinery, dedicated in 1981, has a production capacity of 2 million tons. Cameroon has become self-sufficient in petroleum products since commissioning the refinery.

The oil sector contributed approximately 13.5% to Cameroon's gross domestic product in 1982-83. Oil production was expected to rise from 125,000 barrels per day in 1983 to 156,000 barrels per day in 1985 when output peaks. Cameroon's ultimate recoverable reserves have been calculated at 100 million tons, or 750 million barrels of oil.

An estimated 100 billion cubic meters of natural gas reserves have been discovered, but owing to the lack of demand, it was not being exploited. Plans for a large liquefied natural gas (LNG) plant near Kribi have been shelved, owing to the lack of interest in the private sector for building such a facility unless the long-term demand situation for LNG improves.

Cameroon was one of four countries on the African Continent that produced primary aluminum. Compagnie Camerounaise de l'Aluminium (Alucam) increased the capacity of its aluminum works at Edea from 50,000 to 84,000 tons annually. Permission to expand capacity of the plant to 160,000 tons per year was expected soon. Alucam also has plans to construct a plant for producing alumina. Cameroon has significant bauxite reserves at Minim-Martrap in the north, and the Société d'Etudes des Bauxites du Cameroon (SEBACAM) was interested in developing them.

Deposits of bauxite have been located at Adamaoua and Dschang estimated at 800 million tons and 80 million tons, respectively. The joint venture company, SEBACAM, was set up between the Cameroonian Government and Western aluminum concerns to exploit these reserves.

Another deep sea harbor was planned for the Kribi area of south Cameroon in connection with the use of natural gas reserves. Iron and steel products and cement clinker will also be loaded and unloaded at this harbor. According to preliminary studies the harbor project will require an investment of approximately $315 million.[3]

In 1983, the United States exported approximately $93 million of oil well equipment to Cameroon while importing approximately $515 million of Cameroonian oil. France is Cameroon's principal trading partner.

Pecten Cameroon Co. received a $350 million financing agreement that will pay for development of the Rio del Rey and Lokele areas off Cameroon. The company was 80% indirectly owned by Shell Oil Co. and 20% by Société National des Hydrocarbures, Cameroon's state oil company.

Credit Lyonnais S.A. Bank of Paris and Bankers Trust Co. of New York were the major banks involved. Compagnie Française des Pétroles (TOTAL) and Mobil Oil Co.'s Victoria Field came on-stream at an initial 15,000 barrels per day. Output was scheduled to attain 30,000 barrels per day by yearend. Reserves were put at 30 million barrels recoverable.

Table 1.—Other countries of Central Africa: Production of mineral commodities[1]

Country[2] and commodity[3]	1979	1980	1981	1982[p]	1983[e]
CAMEROON					
Aluminum metal, primary ______ metric tons__	43,200	43,160	36,756	85,358	[4]77,649
Cement, hydraulic ________________ do____	489,560	[r] [5]508,000	[e] [5]516,000	[5]530,000	[4] [5]610,000
Gold, mine output, metal content __ troy ounces__	147	72	316	136	[4]261
Petroleum, crude _ thousand 42-gallon barrels__	12,482	20,045	32,000	[e]35,000	42,000
Pozzolana _________________ metric tons__	NA	NA	53,025	81,028	NA
Stone:					
Limestone ____________________ do____	80,000	39,962	66,625	83,379	[4]50,675
Marble ______________________ do____	665	NA	NA	NA	NA
Tin ore and concentrate:					
Gross weight _________________ do____	12	19	15	[e]15	NA
Metal content ________________ do____	8	13	10	[e]10	NA
CENTRAL AFRICAN REPUBLIC					
Diamond:					
Gem[e] ____________________ carats__	220,500	227,000	208,903	[4]186,573	[4]229,681
Industrial[e] __________________ do____	94,500	115,000	103,000	[4]90,000	[4]65,677
Total ___________________ do____	315,000	342,000	[e]311,903	276,573	[4]295,358
Gold ____________________ troy ounces__	2,181	2,000	1,386	1,000	[4]2,492
Uranium ore, metal content ______ kilograms__	1,500	1,500	--	--	--
CHAD					
Sodium carbonate, natural (natron), slabs (plaques), broken __________ metric tons__	[e]11,000	8,000	5,000	[e]5,000	NA
CONGO					
Cement, hydraulic ________________ do____	[e]50,000	34,000	49,298	39,242	[4]15,034
Copper, mine output, metal content ____ do____	1,000	1,300	245	149	[4]35
Gas, natural:					
Gross[e] ____________ million cubic feet__	9,000	10,000	13,000	13,000	13,000
Marketed __________________ do____	350	350	350	350	350
Gold, mine output, metal content[e] _ troy ounces__	(6)	(6)	[r]48	[r]83	[4]267
Lead, mine output, metal content __ metric tons__	7,000	7,000	7,682	4,095	4,000
Petroleum, crude _ thousand 42-gallon barrels__	19,546	19,861	30,860	33,000	[4]40,271

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Includes data available through Aug. 1, 1984.

[2] In addition to the countries listed, Equatorial Guinea and São Tomé e Principe, covered textually in this chapter, presumably produce modest quantities of a variety of crude construction materials (clays, stone, and sand and gravel) and may produce minor amounts of other mineral commodities (most notably gypsum, lime, and salt), but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3] In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, stone, and sand and gravel) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[4] Reported figure.

[5] Includes imported clinker.

[6] Revised to zero.

CENTRAL AFRICAN REPUBLIC

Reported mineral production of diamonds and gold was valued at approximately $24 million. Total production of diamonds and gold increased approximately 7% and 149%, respectively. Consequently, the mineral sector's contribution to the national economy rose from that of 1982 by approximately 15%.

Mineral activity centers almost entirely in the diamond sector, where diamonds account for 23% of the total export earnings. Diamond smuggling increased to nearby countries, which have lower or no export tax. Both diamonds and gold are exploited by individual prospectors, as the deposits are alluvial and modern mining techniques are not in use. Existing uranium deposits have not been exploited owing to excessive startup costs and transportation difficulties. The potential for petroleum reserves was being investigated by the Exxon Corp., and Continental Oil Co. Exxon Oil Co. conducted oil exploration tests on the border near Chad.

CHAD

For the first time since 1979, Chad issued a national budget amounting to approximately $95 million. Of this budget, Chad contributed approximately $21 million, with the remaining deficit being made up with foreign aid.

For 17 of its 22 years of independence, Chad has been embroiled in internal strife. Rebel forces hostile to the incumbent Government began an open attack on Chad's major northern city of Faya-Largeau on June 23, 1983. The country was embroiled in an armed conflict with no end in sight.

Financial arrangements to resume activity at the Mani stone quarry were negotiated with the Development Bank of the Central African States. The action to open the quarry was vitally important for the reconstruction of Ndjamena.

CONGO

Although the People's Republic of the Congo has several deposits of minerals consisting of potash, phosphate, lead, zinc, copper, gold, and hydrocarbons, only petroleum has been commercially exploited the past few years. The value of crude oil exports during 1983 was $984 million. Crude oil exports amounted to approximately 35 million barrels. Oil production was up 22% compared with that of 1982. Estimated proven reserves as of yearend were 400 million barrels. The capacity of the refinery that opened on December 11, 1982, at Pointe Noire was 21,000 barrels per day. The refinery, owned by Hydro-Congolaise de Raffinage, 51%; and Société Nationale Elf Aquitaine, 49%, runs on indigenous crude and produces products for the local market and export. Over 2 million barrels of fuel oil was exported in 1983. Oil revenue meets two-thirds of the budget needs.

Yanga Field, the sixth deposit discovered in the Congo, was the second largest, smaller only than Emeraude. Yanga Field, producing since June 1981, has produced over 12 million barrels. The reserves at Yanga are estimated to be 486 million barrels, of which 28% is regarded as recoverable. Yanga Field is located approximately 30 miles off Pointe-Noire in the Gulf of Guinea at a water depth of 328 feet. The deposit will contain 71 wells and will be drilled off 4 drilling platforms.

The Emeraude Oilfield, just 12 miles offshore, began production in 1972. With an estimated 600,000 tons of oil reserves at Emeraude, only 17,000 tons has been recovered to date. Because the oil is very thick, and given the current technology, the field may not yield more than 5% of the oil in the reservoir. In midyear 1983, work on a new experiment to improve recovery of the oil by steam injection was begun. The experiment was scheduled to last 3 years.

The future of mining in the Congo was promising as a result of the Congo mining plan developed by France's Bureau de Recherches Géologiques et Minières (BRGM). BRGM secured an exploration license in the Mindouli-Boko-Songho region, where it will be looking for copper, lead, and zinc deposits. Exploration and mining studies are planned in the near future for the iron deposits at Mount Nebemaba in northwestern Congo.

The public cement company at Loutete was undergoing renovation without interrupting factory operations; however, in September 1983, a major fire took place in the factory that shut it down. The plant was scheduled to resume full production in mid-1984.

EQUATORIAL GUINEA

In early 1983, the Government issued a call for bids from international oil and gas companies interested in exploring the country. TOTAL and the Government of Equatorial Guinea signed a contract in November to provide for $1.3 to $1.7 million in seismic work covering 1,300 square kilometers of concession area in offshore water of the Rio Muni Province. The work was to be completed in 2 years.

TOTAL and Shell completed the first phase of seismic work in the onshore coastal concession area in Rio Muni in 1983.

Hispánica de Petróleos S.A. of Spain found natural gas in Equatorial Guinea near yearend.

SÃO TOMÉ E PRINCIPE

A brick factory able to produce 19 tons per year of manufactured clay articles opened May 1, 1983. The new industrial unit manufactures plates, cups, earthenware vessels, bottles, and other similar products. The new factory intends to export its products in the future.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Communauté Financierè Africaine francs (CFAF) to U.S. dollars at the rate of CFAF381.07 = US$1.00.

The Mineral Industry of Other East African Countries

By Kevin Connor[1]

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BURUNDI

There was little change during 1983 in the production of minerals in Burundi. The Government of Burundi, which banned all commercial mining operations in the country in 1979, lifted the ban on mining of alluvial gold deposits and started a program of small-scale artisan gold mining in October. Along with the legal mining of gold, licensed gold trading counters were established. Other mineral commodities produced were kaolin clay, lime, and peat. In compliance with the Government ban, the only mineral wealth exploited for commercial sale and export was alluvial gold. Through financial assistance from the International Bank for Reconstruction and Development (World Bank) and the United Nations Development Program (UNDP), a study to inventory the country's mineral resources continued throughout the year.

As part of this study, during the year, a West German company undertook a drilling program to further outline the nickel reserves of the Musongati area in central Burundi. Results of the work as of yearend were disappointing, with only 12 million tons of ore identified with better than 2% nickel content proven. Investigations also continued during the year regarding the centrally located deposits of vanadium-bearing titaniferous magnetite. A Norwegian company contracted to prepare a prefeasibility study for developing the deposit. The British Sulphur Corp. Ltd. was nearing completion of its $1.2 million[2] study of the phosphatic limestone deposit at Matongo-Bandaga at yearend. Ore reserves of about 17 million tons grading 11% phosphorus pentoxide (P_2O_5) had been identified. The phosphate zone overlies a carbonatite rock, which could provide the basis for a cement industry. Additional drilling was planned for 1984. Exploration for gold was underway in 1983 in northern Burundi through UNDP funding. Several primary deposits of shallow semimassive sulfides with gold values ranging from traces to 11 grams per ton had been discovered. With assistance from the Federal Republic of Germany, bastnasite reserves of 5,400 tons, with associated high europium oxide and cerium content, were verified, and the prospects for finding additional reserves were promising. Secondary cassiterite deposits of as much as 5,000 tons of ore were also identified in the study.

Econo Oy of Finland and the Irish Peat Board continued to survey the peat deposits of Burundi during the year and evaluate the fuel potential of the deposits. Approximately 40% of an estimated 13,000 hectares of peatland had been surveyed as of yearend, with approximately 65% of these peat bogs considered suitable for development. The peat was ranked as good quality despite a high ash content of 11% and was considered similar to European industrial peat. Econo continued to conduct production and processing experiments and utility tests with peat air dried to 30% moisture content. In addition to the fuel potential, other possible uses of the peat in Burundi might be soil conditioning, manufacture of ammonia, and in nickel processing.

The hydrocarbon potential for Lake Tanganyika and the onshore Ruzizi Plain continued to look promising. Aeromagnetic survey work was conducted by the Kenting Co. of Canada, and a team of geophysicists from Duke University, North Carolina, neared completion of seismic survey work and preliminary data analysis on the lake bottom by yearend. Based on the Duke study results, four major potential oil-bearing basins under the lake were identified. The aeromagnetic survey work identified the possibilities of oil in the Ruzizi Plain, where the deposits would probably be smaller, yet cheaper to develop. At yearend, the Government of Burundi was negotiating with the Amoco Oil Co. of the United States and the Société Nationale Elf Aquitaine (SNEA) of France over possible oil exploration and development contracts.

Table 1.—Other countries of East Africa: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Country and commodity	1979	1980	1981	1982[p]	1983[e]
BURUNDI[2] [3]					
Clays: Kaolin	[e]2,000	2,000	2,000	[e]2,000	[4]4,053
Columbium and tantalum ores and concentrates kilograms	2,100	--	--	--	--
Gold troy ounces	133	130	100	100	[4]272
Lime	[e]200	200	283	302	300
Peat	9,000	9,000	9,500	14,000	[4]13,293
Rare-earth metals: Bastnasite concentrate, gross weight	30	--	--	--	--
Tin ore and concentrate:					
Gross weight	17	([5])	--	--	--
Metal content	8	([5])	--	--	--
ETHIOPIA[2]					
Cement, hydraulic	92,757	[r]110,000	130,000	140,000	150,000
Clays: Kaolin	30,000	55,235	9,000	[e]9,000	9,000
Gold, mine output, metal content troy ounces	7,970	9,000	11,930	[e]12,000	14,000
Gypsum and anhydrite, crude	925	900	4,200	[e]4,000	4,000
Petroleum refinery products:					
Gasoline -- thousand 42-gallon barrels	683	706	798	801	[4]855
Kerosine and jet fuel do	210	304	230	466	[4]465
Distillate fuel oil do	1,095	1,176	1,344	1,493	[4]1,514
Residual fuel oil do	2,021	1,598	2,224	2,173	[4]2,033
Other do	114	125	37	129	[4]146
Refinery fuel and losses do	265	813	696	548	[4]475
Total do	4,388	4,722	5,329	5,610	[4]5,488
Platinum, mine output, metal content troy ounces	108	113	[r] [e]125	125	125
Pumice cubic meters	4,590	1,724	30,300	[e]30,000	[4]5,625
Salt:					
Rock[e]	15,000	15,000	15,000	15,000	15,000
Marine	92,737	100,000	110,000	[e]110,000	110,000
Stone, sand and gravel:					
Limestone	7,308	1,800	5,500	[e]5,000	5,000
Sand cubic meters	97,200	407,421	655,000	[e]650,000	650,000
Other	383,940	402,085	1,970,000	[e]2,000,000	2,000,000
KENYA					
Barite	[e]300	6,647	6,000	--	300

See footnotes at end of table.

Table 1.—Other countries of East Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country and commodity	1979	1980	1981	1982[p]	1983[e]
KENYA —Continued					
Beryllium: Beryl concentrate, gross weight	(5)	(5)	--	--	--
Carbon dioxide, natural	NA	3,014	3,000	2,700	NA
Cement, hydraulic thousand tons	851	1,272	1,300	[e]1,300	1,300
Clays: Kaolin	[e]1,500	1,487	1,400	1,077	1,400
Corundum	[e](5)	(5)	--	(5)	NA
Diatomite	1,266	1,677	1,700	1,783	1,570
Feldspar	[e]1,000	387	400	--	700
Fluorspar	77,104	93,378	90,000	88,726	59,084
Gem stones, precious and semiprecious:					
Amethyst kilograms	--	--	--	3	5
Aquamarine do.	NA	35	NA	(5)	4
Garnet do.	NA	237	NA	63	25
Ruby do.	NA	414	NA	--	98
Sapphire do.	NA	148	NA	33	--
Tourmaline do.	NA	39	NA	11	37
Gold, mine output, metal content troy ounces	[e]200	125	.100	21	100
Guano	NA	--	50	(5)	--
Gypsum and anhydrite, crude	NA	--	--	300	500
Iron and steel:					
Iron ore:					
Gross weight	20,000	14,567	14,000	4,310	14,000
Iron content[e]	12,000	9,469	9,000	NA	9,000
Steel, crude[e]	10,000	10,000	10,000	NA	10,000
Lime	27,000	26,025	27,000	21,941	34,869
Magnesite	[e]4,000	1	10	--	--
Petroleum refinery products:					
Gasoline, motor thousand 42-gallon barrels	4,060	3,629	NA	NA	NA
Jet fuel do.	4,209	3,492	NA	NA	NA
Distillate fuel oil do.	1,211	4,540	NA	NA	NA
Residual fuel oil do.	7,574	8,824	NA	NA	NA
Asphalt do.	24	188	NA	NA	NA
Liquefied petroleum gas do.	186	280	NA	NA	NA
Unspocified do.	461	693	NA	NA	NA
Refinery fuel and losses do.	932	679	NA	NA	NA
Total do.	18,657	22,325	22,000	22,000	22,000
Salt:					
Crude	21,846	26,966	27,000	NA	NA
Refined	[e]12,000	20,050	21,000	24,411	83,427
Sodium compounds, n.e.s.:					
Soda, crushed, raw	NA	1,530	1,600	2,412	4,260
Soda ash	223,845	203,768	250,000	160,440	193,690
Stone, sand and gravel:					
Calcareous:					
Calcite	NA	--	NA	--	--
Coral (for cement manufacture)[e]	NA	[r]NA	1,000,000	1,442,928	NA
Kunkur (for cement manufacture)	NA	121,460	125,000	NA	NA
Limestone (for cement manufacture)	NA	1,540,777	500,000	--	--
Sand	NA	[r]NA	25,000	NA	NA
Shale	NA	295,183	300,000	259,426	NA
Vermiculite	2,260	2,558	2,600	1,556	NA
Wollastonite	NA	--	50	--	--
LESOTHO[2]					
Diamond:					
Gem[e] carats	41,937	42,971	42,000	33,119	--
Industrial[e] do.	10,484	10,743	10,921	9,000	--
Total do.	52,421	53,714	52,921	42,119	--
Stone[e] cubic meters	25,000	25,000	25,000	25,000	25,000
MALAWI[2]					
Cement, hydraulic thousand tons	103	92	78	53	[4]70
Gem stones, precious and semiprecious: Agate[e]	6	7	7	7	7
Stone: Limestone	168,604	122,814	116,118	80	[4]109
MAURITIUS[2]					
Lime	[e]8,000	7,000	7,000	7,000	7,000
Salt	[e]6,000	6,000	6,000	6,000	6,000
Stone: Basalt, not further described	970,000	1,400,000	1,083,500	942,000	1,100,000

See footnotes at end of table.

Table 1.—Other countries of East Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country and commodity	1979	1980	1981	1982[p]	1983[e]
MOZAMBIQUE[2]					
Beryllium: Beryl concentrate, gross weight	28	20	20	[e]20	20
Cement, hydraulic thousand tons	273	[r]236	232	261	300
Clays: Bentonite	1,656	[e]1,500	[e]1,500	[e]1,500	500
Coal: Bituminous thousand tons	320	408	[e]450	[e]500	500
Columbium and tantalum ores and concentrates, gross weight:					
Columbite[e] kilograms	2,300	NA	NA	NA	NA
Microlite do.	[e]31,750	NA	NA	NA	NA
Tantalite[e] do.	31,750	NA	NA	NA	NA
Copper, mine output, salable ore and concentrate:					
Gross weight	1,125	[e]1,000	[e]1,000	[e]1,000	1,000
Metal content	225	[e]200	[e]200	[e]200	200
Gem stones, precious and semiprecious:					
Beryl crystals kilograms	1,920	2,000	[e]2,000	[e]2,000	2,000
Garnet do.	11,200	12,000	[e]12,000	[e]12,000	12,000
Lime, hydraulic[e]	10,000	10,000	10,000	10,000	10,000
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	336	510	[e]470	NA	NA
Kerosine and jet fuel do.	282	330	[e]310	NA	NA
Distillate fuel oil do.	1,668	746	[e]670	NA	NA
Residual fuel oil do.	236	1,332	[e]1,200	NA	NA
Other do.	227	323	[e]80	NA	NA
Refinery fuel and losses do.	128	130	[e]100	NA	NA
Total do.	2,877	3,371	[e]2,830	NA	NA
Salt, marine[e]	28,000	28,000	28,000	28,000	28,000
RWANDA[2]					
Beryllium: Beryl concentrate, gross weight	46	108	59	69	[4]32
Columbium and tantalum ores and concentrates: Columbite-tantalite, gross weight	47	60	57	62	[4]50
Gold, mine output, metal content troy ounces	472	944	1,200	286	[4]623
Lithium minerals: Amblygonite[e]	28	30	NA	--	--
Tin:					
Mine output, metal content	1,351	1,464	1,266	1,171	[4]1,068
Smelter output, metal content	--	--	--	908	[4]1,110
Tungsten, mine output, metal content	505	431	354	409	[4]292
SEYCHELLES[2] [6]					
Guano	6,583	4,285	[e]4,500	[e]4,500	4,500
SOMALIA[2]					
Salt, marine[e]	30,000	30,000	30,000	30,000	30,000
Sepiolite, meerschaum	--	--	--	9	10
SWAZILAND[2]					
Asbestos: Chrysotile	34,294	32,833	35,800	30,100	[4]31,275
Coal: Anthracite	168,409	175,984	157,700	115,000	[4]103,158
Stone: Quarry product cubic meters	247,090	74,045	82,053	90,763	[4]145,485
Tin, mine output, metal content	--	--	--	--	[4]11
TANZANIA					
Cement, hydraulic thousand tons	280	300	380	400	500
Clays:					
Bentonite	80	80	50	50	75
Kaolin[e]	1,100	1,100	750	750	[4]1,276
Coal: Bituminous[e]	900	1,000	1,000	1,000	[4]9,996
Diamond[7] carats	313,551	273,705	[e]250,000	250,000	[4]260,574
Gem stones, precious and semiprecious other than diamond:[8]					
Amethyst kilograms	28	48	[e]50	NA	NA
Aquamarine do.	NA	533	560	NA	NA
Beryl (gem only) do.	2	(5)	[e]5	NA	NA
Chrysoprase and opal do.	2	(5)	12	12	NA
Corundum (gem only) do.	6	[e]7	[e]7	NA	NA
Garnet and rhodolite do.	37	9	13	13	NA
Ruby and sapphire do.	20	10	[e]11	NA	NA
Scapolite do.	9	[e]10	[e]10	NA	NA
Tourmaline do.	5	2	[e]3	NA	NA
Zircon do.	5	3	[e]4	NA	NA
Zoisite (tanzanite) do.	10	2	[e]3	NA	NA
Unspecified do.	--	9	[e]10	10	NA
Total do.	NA	[e]633	[e]688	NA	[4]646

See footnotes at end of table.

Table 1.—Other countries of East Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country and commodity	1979	1980	1981	1982[p]	1983[e]
TANZANIA —Continued					
Gold, refined troy ounces	322	246	[e]400	[e]600	800
Gypsum and anhydrite, crude	9,430	[e]11,300	[e]12,000	[e]12,000	12,000
Lime, hydrated and quicklime	6,111	[e]6,500	[e]6,800	[e]6,800	[4]3,006
Mica, sheet	6	[e]10	5	5	(5)
Nitrogen: N content of ammonia	5,000	[r] [e]5,500	[e]6,000	[e]6,000	6,000
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	781	[e]780	[e]800	[e]800	800
Kerosine do.	292	[e]300	[e]300	[e]300	300
Jet fuel do.	244	[e]240	[e]220	[e]220	220
Distillate fuel oil do.	976	[e]1,000	[e]1,050	[e]1,050	1,050
Residual fuel oil do.	1,710	[e]1,700	[e]1,750	[e]1,750	1,750
Liquefied petroleum gas do.	78	[e]80	[e]80	[e]80	80
Refinery fuel and losses do.	300	[e]300	[e]300	[e]300	300
Total do.	4,381	4,400	[e]4,500	[e]4,500	4,500
Phosphate minerals: Apatite	--	--	--	--	165,000
Salt, all types	37,078	[e]40,000	[e]41,000	[r] [e]37,000	[4]28,297
Tin, mine output, metal content	10	[e]10	9	9	[4]6
UGANDA					
Bismuth, mine output, metal content[e] kilograms	5,000	NA	NA	NA	NA
Cement, hydraulic	50,000	10,000	[r] [e]20,000	[r] [e]30,000	40,000
Columbium and tantalum ores and concentrates, gross weight[e] kilograms	2,260	--	--	--	--
Copper, mine output, metal content	--	--	--	1,400	1,000
Lime, hydrated and quicklime[e]	28,000	15,000	15,000	15,000	15,000
Salt, evaporated[e]	500	[r]500	[r]5,000	[r]5,500	5,000
Tin, mine output, metal content[e]	60	30	30	30	30
Tungsten, mine output, metal content	20	20	20	20	20

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Includes data available through Sept. 4, 1984.

[2] In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, stone, and sand and gravel) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3] Limited quantities of other pegmatite minerals may also be produced, but output is not reported.

[4] Reported figure.

[5] Less than 1/2 unit.

[6] Data represent sales; actual production is not reported.

[7] Diamond figures are estimated to represent 50% gem-quality and 50% industrial-quality stones.

[8] Exports.

COMOROS

The Federal Islamic Republic of Comoros was one of the least developed countries in the world in 1983, with a per capita income of slightly over $300. The country consists of four main islands in the Mozambique Channel west of the northern end of the island nation of Madagascar. There were no known commercially exploitable minerals on the islands in 1983. Only small sand and gravel excavations were operated during the year to supply local construction needs. All other mineral-related requirements were imported.

DJIBOUTI

Mineral production in Djibouti during the year was limited to small sand and gravel operations for domestic construction projects. A final feasibility study on the planned cement production works at Ali Sabieh was scheduled for completion in February 1984. Austrian authorities pledged financial aid during a donor conference held in Djibouti during November 1983. Plant cost was estimated at between $15 and $20 million.[3] Design capacity of the proposed coal-fired plant was 60,000 tons per year, with approximately one-half of the production slated for export. Also at the November donor conference, the World Bank agreed to cofinance, with the Organization of Petroleum Exporting Countries and the Italian Government, $5 million for a second-phase geothermal exploration program for Djibouti.

ETHIOPIA

There was little change within the mineral industry of Ethiopia, which continued to be a minor sector of the national economy during 1983. Petroleum products, cement, salt, and gold were the most important mineral commodities produced during the year. In January, the Government of Ethiopia issued a joint venture proclamation that stipulated a 51% minimum Government share in joint ventures between it and foreign investors. A section of the new law allowed the Government to nationalize a joint venture in the event the Government deemed it necessary in the national interest. This stipulation continued to cloud prospects for foreign investment throughout the year. The Ethiopian Building Materials Corp. was reported to have finished the construction of its 1,100-ton-per-day-capacity, dry-process cement plant at Mugher. Improvements were completed at yearend on the cement kiln and power supply system at the Massawa cement plant. Production at the plant in 1984 was expected to increase by 60%, to 55,000 tons.

Petroleum exploration efforts progressed during 1983, with Chevron Overseas Petroleum Inc. continuing geophysical studies of a 16,000-square-kilometer area in the Gambela region in the southwestern part of the country across from the Sudan border. Under an aid agreement between Ethiopia and the Soviet Union, the Soviets continued to explore for petroleum and natural gas in the Ogaden region. The Soviets were expected to drill at least three wildcat wells under the contract.

At yearend, the Ethiopia Petroleum Corp. had nearly completed a 120,000-barrel oil storage depot in Assab, built with assistance from the Soviet Union. The Government's petroleum agency had also completed expansion work on the Assab refinery during the year, raising the plant's refining capacity from 5.3 to 6.5 million barrels per year. Late in the year, work began at the refinery on the construction of four large storage tanks for naphtha.

In June, the International Development Agency (IDA) approved a $7 million loan for petroleum exploration and geothermal reconnaissance in Ethiopia. The project was to assist the Government in promoting Ethiopia's petroleum potential and, in negotiating contracts with international petroleum firms, collect new seismic data on 800 line kilometers of offshore territory, reevaluate existing seismic data on 3000 line kilometers of territory, conduct a feasibility study of geothermal sites northeast of Addis Ababa, continue natural gas study work, and supply all equipment and training for office personnel involved in the project work. The UNDP was committed to provide $1.3 million for the project, and the Government of Ethiopia was to contribute $1.15 million,[4] for a total project cost of $9.45 million.

Table 2.—Ethiopia: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	Destinations, 1982	
		United States	Other (principal)
Aluminum: Metal including alloys, scrap	212	--	All to Djibouti.
Petroleum refinery products: Residual fuel oil 42-gallon barrels	10,552	--	Yemen (Aden) 5,886; Djibouti 3,267.
Salt and brine	11,000	--	France 5,500; Malaysia 5,500.
Stone, sand and gravel: Limestone other than dimension	705	--	Yemen (Aden) 700.

[1] Table prepared by Virginia A. Woodson. Data for 1981 were not available at the time of publication.

Table 3.—Ethiopia: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	Sources, 1982	
		United States	Other (principal)
METALS			
Alkaline-earth metals	19	--	All from U.S.S.R.
Aluminum: Metal including alloys, semimanufactures	435	8	Italy 114; Belgium-Luxembourg 113; West Germany 63.
Copper: Metal including alloys, semimanufactures	309	6	Poland 200; Yugoslavia 49.
Iron and steel: Metal:			
Scrap	572	NA	Kenya 178; Japan 83; Italy 82.
Ferromanganese	800	--	Japan 763; Belgium-Luxembourg 23.
Steel, primary forms	14,040	--	Poland 10,321; Belgium-Luxembourg 2,096.
Semimanufactures:			
Bars, rods, angles, shapes, sections	6,924	--	Republic of Korea 1,661; West Germany 1,649; East Germany 1,012.
Universals, plates, sheets	17,413	30	Japan 12,523; U.S.S.R. 563; West Germany 553.
Hoop and strip	307	--	Italy 180; East Germany 31.
Wire	874	--	Japan 368; Republic of Korea 337.
Tubes, pipes, fittings	7,592	8	U.S.S.R. 1,580; Italy 1,373; West Germany 1,275.
Castings and forgings, rough	740	--	U.S.S.R. 698; United Kingdom 22.
Lead: Metal including alloys, unwrought	116	--	Italy 75; West Germany 41.
Manganese: Oxides	232	--	West Germany 107; United Kingdom 75.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$37	--	All from Japan.
Tin: Metal including alloys, semimanufactures	340	--	Japan 275; Netherlands 65.
Zinc:			
Oxides	16	--	Belgium-Luxembourg 13.
Metal including alloys:			
Scrap	251	--	Japan 240; West Germany 10.
Unwrought	399	--	All from Japan.
NONMETALS			
Abrasives, n.e.s.: Grinding and polishing wheels and stones	887	--	Denmark 659; India 94.
Asbestos, crude	671	--	Italy 150; unspecified 521.
Cement	108,798	--	Mainly from U.S.S.R.
Clays, crude	1,371	--	West Germany 609; United Kingdom 449; U.S.S.R. 293.
Fertilizer materials: Manufactured:			
Nitrogenous	530	--	All from West Germany.
Unspecified and mixed	24,325	--	West Germany 17,500; Bulgaria 6,825.
Graphite, natural	52	--	U.S.S.R. 51.
Pigments, mineral: Iron oxides and hydroxides, processed	250	--	West Germany 109; United Kingdom 75.
Sodium compounds, n.e.s.:			
Carbonate, manufactured	610	--	Romania 600.
Sulfate, manufactured	3,385	--	West Germany 1,559; Switzerland 616; United Kingdom 436.
Stone, sand and gravel:			
Dimension stone: Crude and partly worked	19	--	All from Hong Kong.
Dolomite, chiefly refractory-grade	118	--	All from Italy.
Sulfur:			
Elemental: Colloidal, precipitated, sublimed	483	--	All from West Germany.
Sulfuric acid	1,233	--	West Germany 515; United Kingdom 303; Netherlands 244.
Talc, steatite, soapstone, pyrophyllite	53	--	U.S.S.R. 51.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	58	--	United Kingdom 40; West Germany 13.
Carbon: Carbon black	680	456	Israel 71; North Korea 70; Japan 37.
Gas, natural: Gaseous million cubic feet	51	--	All from Italy.
Petroleum:			
Crude thousand 42-gallon barrels	5,399	--	All from U.S.S.R.
Refinery products:			
Gasoline, motor do	27,446	14,212	Italy 12,835.
Mineral jelly and wax do	16,086	--	West Germany 5,367; China 3,620; Netherlands 2,581.
Kerosine and jet fuel do	248	--	All from Djibouti.
Distillate fuel oil do	12,943	5,498	United Kingdom 4,648; Netherlands 1,894.
Lubricants do	93,156	896	United Kingdom 55,748; Italy 18,242; West Germany 5,614.
Residual fuel oil do	28,571	1,412	West Germany 26,960.

NA Not available.

[1] Table prepared by Virginia A. Woodson. Data for 1981 were not available at the time of publication.

KENYA

Throughout 1983, the Government of Kenya was faced with a budget crisis. Kenya's debt service ratio as a percentage of export goods and services continued to rise, from 17.3% in 1981 to 24.4% in 1983. External aid donors were essential to the resolution of Kenya's trade and budget imbalances. Under three standby arrangements beginning in October 1980, the International Monetary Fund and the World Bank had provided Kenya with $690 million in credits. New structural changes and reforms in Kenya in 1983 were beginning to restore equilibrium in the budget and balance of payments. Foreign exchange reserves registered some improvement. The Government presented a new 5-year plan (1984-88) in December 1983, placing greater emphasis on decentralization in Government policies and attainment of self-sufficiency for the country's internal needs and growth sectors. Major donors of credit encouraged the Kenyan Government to initiate liberalized policies that would provide stimulus to the private sector.

Kenya's largest cement producer, Bamburi Portland Cement Co. Ltd., experienced a decline in production, reporting 970,000 tons of cement products produced, 75% of which was exported. The company continued to suffer from shortages of raw materials and spare machinery parts. These problems, along with frequent power interruptions, were the contributing factors to the lower production. Conversion of the company's cement kilns to coal firing was completed, which is expected to result in energy savings and improved reliability of fuel supplies.

The extremely poor world market for acid-grade fluorspar was the major reason for the low production of approximately 60,000 tons from the Kenya Fluorspar Co. Ltd. operation, Kenya's only fluorspar producer. The plant shut down several times during the year, allowing the company to complete needed major maintenance work on two of the plant's mills and also to build an expanded storage area at Mombasa.

Kenya moved ahead in diversifying its energy sources by shifting much of its electricity production to hydroelectric and geothermal powerplants. The World Bank loaned the Government $12 million to expand the new Olkaria Geothermal Power Project. Total cost of the project was $41.6 million.[5] Hydropower supplied 20% of the total energy needs. New Kiambere Hydroelectric Power Project loans were approved in December. Cost of the project was estimated at $353.8 million. The World Bank approved $95 million of this total.

Kenya cut import duties by 14.7% and abolished the duty on raw materials for its iron and steel industries in an effort to provide relief for the country's lagging industrial sector. The Ganjiyan Group of steel products manufacturing companies was in the process of establishing a steel-rolling mill at Ruirv, with capacity to roll 60,000 tons of imported billets per year. Billet imports will be drastically reduced when Ruirv expands to recycle 30,000 tons of local scrap metal per year.

The Government shelved plans for its first nitrogen fertilizer complex. The plant was to have been situated in Mombasa and had been scheduled for completion in 1983. The decision to shelve the project was based on financial considerations, and because project management felt that the domestic demand, the only expected market, would not absorb all the output from the plant.

Kenya has few mineral deposits other than soda ash, gem stones, limestone, and fluorspar. Soda ash remained Kenya's principal foreign exchange earner in the minerals sector in 1983. Magadi Soda Co. announced a plant expansion program that was completed during the year at its complex south of Nairobi, increasing the capacity of the operation to 300,000 tons per year. Production at the plant complex was slightly under 200,000 tons. Early in the year, Magadi entered into a trade agreement with China for the sale of 40,000 tons of soda ash valued at approximately $40 million. The first shipment of 10,000 tons took place in July 1983. The remaining 30,000 tons was shipped in three 10,000-ton lots in August, September, and October. Kenya's soda ash was exported to Asia, the Middle East, Europe, and the Republic of South Africa.

LESOTHO

During 1983, there were no commercial mining operations in Lesotho. With the closure of Lesotho's only commercial mineral venture, the Letseng-la-Terai diamond operation in late 1982, the country's domestic mineral-related activities were reduced to the production of sand and gravel for local construction purposes. Lesotho continued, however, to export mine labor to the Republic of South Africa, which in 1983 employed about 54,000 citizens of Lesotho as mine workers.

MALAWI

The Malawian economy grew at a rate of nearly 3% during 1983. The country's construction industry revived somewhat, which was reflected in a 32% increase in cement output by the Portland Cement Co. Malawi Ltd. Mineral deposits exploited during the year included limestone, agate, and gold. Reported gold production was very insignificant. A small amount of lime for agricultural purposes was also processed from the limestone. The UNDP and the Malawian Government were, at yearend, close to finalizing plans for a $5 million mineral exploration project. Aerial surveys for petroleum and other minerals were to be carried out in 1984 by consultant services. On March 30, the Government enacted the Petroleum Exploration and Production Act of 1983. Under the new law, a commission was to be formed to regulate licensing of petroleum exploration and production activities, levying and collecting petroleum taxes and royalties, ownership and control of reserves, and protection of the environment. Hunting Geology and Geophysics Ltd. carried out an aeromagnetic survey for Shell Oil Co. of the United States in 1982. Three basins with oil deposit potential were discovered by the survey, although their locations, under 500 meters of water in upper Lake Malawi, led Shell Oil to relinquish its option to continue further exploratory work.

Table 4.—Malawi: Exports and reexports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	Destinations, 1981	
		United States	Other (principal)
Aluminum: Metal including alloys:			
Scrap	157	--	Zimbabwe 105; Republic of South Africa 52.
Semimanufactures	37	NA	NA.
Copper: Metal including alloys, scrap	36	--	Republic of South Africa 24; Zimbabwe 12.
Iron and steel: Metal:			
Pig iron, cast iron, related materials value	$3,000	--	All to Republic of South Africa.
Semimanufactures:			
Bars, rods, angles, shapes, sections do.	$25,000	NA	NA.
Universals, plates, sheets do.	$216,000	--	All to Mozambique.
Rails and accessories	69	NA	NA.
Tubes, pipes, fittings	88	NA	NA.
Lead: Metal including alloys, scrap	88	--	All to Zimbabwe.
Petroleum: Crude 42-gallon barrels	4,037	58	Zimbabwe 3,956.

NA Not available.

[1] Table prepared by Virginia A. Woodson.

Table 5.—Malawi: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	Sources, 1981	
		United States	Other (principal)
METALS			
Aluminum: Metal including alloys:			
Scrap	16	--	All from Zimbabwe.
Semimanufactures	253	--	Zimbabwe 71; Republic of South Africa 68; West Germany 51.
Copper: Metal including alloys, semimanufactures	46	--	Republic of South Africa 28; United Kingdom 12.
Iron and steel: Metal:			
Pig iron, cast iron, related materials value	$14,000	--	United Kingdom $12,000.
Semimanufactures:			
Bars, rods, angles, shapes, sections	3,982	--	Zimbabwe 2,674; Republic of South Africa 1,123.
Universals, plates, sheets	4,936	--	Republic of South Africa 2,670; Japan 1,734.
Hoop and strip	332	--	All from Republic of South Africa.
Rails and accessories	25	--	Republic of South Africa 19.
Wire	1,147	--	Zimbabwe 902; United Kingdom 119.
Tubes, pipes, fittings	9,977	--	Republic of South Africa 8,950; United Kingdom 577.
Castings and forgings, rough	3	--	All from Zimbabwe.
Lead: Metal including alloys:			
Unwrought	15	--	Do.
Semimanufactures	8	--	Republic of South Africa 7.
Zinc: Metal including alloys, all forms	38	--	All from Republic of South Africa.
NONMETALS			
Abrasives, n.e.s.: Grinding and polishing wheels and stones	20	--	Republic of South Africa 9; United Kingdom 4.
Cement	23,054	--	Zimbabwe 11,079; Zambia 9,727.
Fertilizer materials:			
Crude, n.e.s	15,207	--	Zambia 15,120.
Manufactured:			
Nitrogenous	104,461	--	West Germany 56,443; Italy 19,979; Netherlands 17,071.
Phosphatic	11,556	--	All from Republic of South Africa.
Potassic	6,637	--	Switzerland 2,500; West Germany 1,787; France 1,750.
Unspecified and mixed	18	--	All from Republic of South Africa.
Lime	3,153	--	Zambia 2,756; Republic of South Africa 315.
Salt and brine	13,689	--	Mozambique 4,243; Republic of South Africa 3,976; Cyprus 2,500.
Stone, sand and gravel:			
Dimension stone: Worked	8	--	Zimbabwe 7.
Sand other than metal-bearing	109	--	Republic of South Africa 108.
Sulfur: Elemental: Colloidal, precipitated, sublimed	15	--	All from Republic of South Africa.
Other: Crude	3,382	9	Republic of South Africa 2,127; Zambia 1,241.
MINERAL FUELS AND RELATED MATERIALS			
Coal: Anthracite and bituminous	47,774	--	Mozambique 26,984; Republic of South Africa 20,717.
Petroleum:			
Crude 42-gallon barrels	14	--	All from Republic of South Africa.
Refinery products:			
Gasoline do	344,191	527	Republic of South Africa 189,618; Saudi Arabia 42,381; France 31,527.
Mineral jelly and wax do	42,316	2,951	Republic of South Africa 13,489; France 11,057.
Kerosine and jet fuel do	82,049	--	Republic of South Africa 80,933.
Distillate fuel oil do	505,751	--	Republic of South Africa 269,642; Saudi Arabia 72,489; Iran 41,142.
Lubricants do	31,451	140	Republic of South Africa 27,662; Netherlands 3,374.
Residual fuel oil do	13,806	--	Republic of South Africa 11,062; France 1,558.

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[1] Table prepared by Virginia A. Woodson.

MAURITIUS

The mineral industry of Mauritius remained insignificant in 1983, with only small amounts of salt and lime produced, along with some sand, gravel, and stone for local building needs. Retail value of the minerals produced was estimated at $5 million. All other mineral needs for the year were imported, which included 1.4 million barrels of petroleum products valued at approximately $50 million. Construction work was virtually completed on a new hydroelectric dam on the Champagne River. The total power capacity of the dam's two turbine generators was reported to be 30 megawatts, and the dam was expected to generate 40 million kilowatt hours of electricity per year.

MOZAMBIQUE

The mineral industry of Mozambique remained in a depressed state in 1983. Small quantities of various minerals were extracted from several different districts within the country. Marble was mined in Cabo Delgado District; tantalum, columbium, and beryllium were mined in Zambezia District; copper and asbestos, in Manica District; garnet, in Niassa District; kaolin and feldspar, in Nampula District; and bentonite, near the city of Maputo. Sea salt was also extracted in the Maputo area. All of the metalliferous ore was exported, because Mozambique had no processing capability for these raw mineral commodities. The semiprecious stones produced were cut and polished within the country and exported, mostly to Europe. Most of the bentonite and kaolin clay produced was used domestically for a wide variety of purposes.

For the second time during the year, Empresa Nacional de Hidrocarbonetos de Mocambique (ENH), the Mozambican Government agency that handles hydrocarbon fuel-related matters in the country, postponed the bidding deadline for offshore petroleum exploration concessions in Mozambican waters. Initially, the deadline for the bid submissions had been September 30. However, in July, the deadline was extended to December 10. Then, in December, the deadline was again extended to March 31, 1984. This was in response to requests from several international oil companies that were preparing bids during late 1983 but needed additional preparation time. Of the offshore blocks designated for bidding, the most promising were reported to be in the Zambesi Basin off Beira. Mozambique's onshore portion of the Rovuma Basin in the northeast corner of Mozambique was also considered an attractive petroleum prospect, and in July of 1983, ENH completed negotiations on this area for a production-sharing contract with Esso Exploration Oceanic and Shell Petroleum Development Mozambique.

The geological surveys completed in mid-1982 by the Geophysical Co. of Norway and Western Geophysical Co. of the United States provided 25,000 square kilometers of new seismic data, which for the first time provided a complete geological profile of Mozambique's sedimentary basins. Subsequent analysis of 12,800 square kilometers of new seismic data encompassing the southern half of the Mozambique Basin and combined with old well logs, revealed promising petroleum potential according to interpretation geologists from Western Geophysical.

The Government of Mozambique continued with plans to exploit the Pande Island natural gasfield for ammonia production. Owing to financial constraints, plans for a large-scale ammonia plant with downstream conversion to urea were abandoned at the beginning of the year. In midyear, the Quimigal Co. of Portugal proposed a small plant complex for producing 360 tons per day of ammonia. The possibility of using existing mobile skid-mounted plant equipment from the Cargill Corp. of the United States was looked into as part of the study by Quimigal. The equipment had been put in storage in 1976, was in good condition, and was considered a viable alternative to purchasing new equipment. The proposed market for the ammonia was Swaziland Chemical Industries Co., which owned and operated an ammonia terminal at Maputo.

REUNION

Reported mineral activity on the island of Reunion was limited to the operation of a 200,000-ton-per-year cement clinker grinding facility at Saint Denis, which manufactured cement mix from imported materials. Reunion, a 2,500-square-kilometer island, had slightly over 0.5 million inhabitants in 1983 and remained an overseas department of France.

Table 6.—Reunion: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
Aluminum: Metal including alloys, scrap	39	27	--	All to France.
Cement	6,390	506	--	Madagascar 504; Comoros 2.
Copper: Metal including alloys:				
Scrap	162	118	--	All to France.
Semimanufactures	--	16	--	Do.
Fertilizer materials: Manufactured	29	15	--	All to Comoros.
Iron and steel: Metal: Semimanufactures:				
Bars, rods, angles, shapes, sections	104	116	--	Comoros 60; Madagascar 56.
Universals, plates, sheets	21	87	--	Comoros 66; Madagascar 21.
Tubes, pipes, fittings	45	10	--	Comoros 9.
Lead: Metal including alloys:				
Scrap	101	--		
Unwrought	--	12	--	All to France.
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	487	371	--	All to Comoros.
Kerosine and jet fuel do	--	4,534	--	Do.
Lubricants do	980	952	--	Comoros 924; France 21; Madagascar 7.
Bitumen and other residues do	212	10,072	--	Madagascar 10,054; Comoros 18.

[1] Table prepared by Virginia A. Woodson.

Table 7.—Reunion: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, semimanufactures	254	254	--	France 227; Belgium-Luxembourg 20; Italy 3.
Copper: Metal including alloys, semimanufactures	150	138	--	France 127; Republic of South Africa 7.
Iron and steel: Metal:				
Steel, primary forms	43	--		
Semimanufactures:				
Bars, rods, angles, shapes, sections	13,970	17,382	--	France 9,482; Republic of South Africa 4,813; Belgium-Luxembourg 1,417.
Universals, plates, sheets	12,792	15,622	--	France 11,517; Republic of South Africa 2,356; Belgium-Luxembourg 1,562.
Hoop and strip	66	57	--	All from France.
Rails and accessories	31	38	--	Do.
Wire	430	570	--	France 425; Republic of South Africa 125; Italy 20.
Tubes, pipes, fittings	4,992	6,592	([2])	France 4,446; Republic of South Africa 1,669.
Castings and forgings, rough	519	355	--	France 345; Belgium-Luxembourg 10.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$1	--		

See footnotes at end of table.

Table 7.—Reunion: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$34	$11	--	All from France.
Titanium: Oxides	180	211	--	United Kingdom 185; France 18; Spain 8.
Zinc: Oxides	8	14	--	All from France.
Other: Base metals including alloys, all forms value, thousands	$24	--		
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	28	25	--	France 23; Japan 1.
Barite and witherite	20	10	--	All from France.
Cement	129,926	172,181	--	Republic of South Africa 86,758; Kenya 85,147; France 275.
Chalk	1,127	830	--	All from France.
Clays, crude	113	61	--	France 49; Republic of South Africa 12.
Diamond: Gem, not set or strung value, thousands	$110	$42	--	France $36; India $6.
Diatomite and other infusorial earth	43	46	--	France 40; West Germany 6.
Fertilizer materials: Manufactured:				
Nitrogenous	2,166	1,624	--	France 1,118; Italy 306.
Phosphatic	703	122	--	All from France.
Potassic	--	52	--	Belgium-Luxembourg 50; France 2.
Unspecified and mixed	32,226	20,484	--	France 10,472; Italy 8,000; Mauritius 2,008.
Gypsum and plaster	4,600	6,728	--	All from France.
Lime	1,609	1,354	--	France 1,178; Republic of South Africa 140; Mauritius 36.
Magnesite	208	109	--	All from Netherlands.
Pigments, mineral: Iron oxides and hydroxides, processed	33	26	--	All from West Germany.
Precious and semiprecious stones other than diamond: Gem material value, thousands	$75	$59	--	France $53; Madagascar $3.
Salt and brine	2,690	2,610	--	West Germany 1,131; Madagascar 690; Republic of South Africa 24.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	--	13	--	Bulgaria 7; France 6.
Sulfate, manufactured	209	178	--	France 147; Belgium-Luxembourg 25; West Germany 6.
Stone, sand and gravel:				
Dimension stone, worked	206	243	--	France 139; Italy 90; Mauritius 14.
Dolomite, chiefly refractory-grade	--	54	--	All from France.
Gravel and crushed rock	--	21	--	Do.
Quartz and quartzite	--	10	--	Do.
Sand other than metal-bearing	187	129	--	Do.
Sulfur: Sulfuric acid	72	94	--	France 46; Belgium-Luxembourg 38; Netherlands 10.
Talc, steatite, soapstone, pyrophyllite	27	32	--	All from France.
Other: Crude	34	34	--	France 33; West Germany 1.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum:				
Crude 42-gallon barrels	--	35,561	--	All from Mexico.
Refinery products:				
Liquefied petroleum gas do	127,890	150,139	--	Australia 71,723; Bahrain 71,073; Singapore 6,937.
Gasoline do	587,052	643,595	--	Bahrain 511,284; Yemen (Aden) 120,428; Singapore 7,650.
Kerosine and jet fuel do	251,480	312,387	--	Bahrain 195,990; Yemen (Aden) 61,760; Singapore 24,653.
Distillate fuel oil do	416,193	490,361	--	Bahrain 345,883; Yemen (Aden) 109,878; Italy 28,734.
Lubricants do	21,707	372,085	7	Venezuela 349,692; France 13,363.
Residual fuel oil do	32,341	43,749	--	All from Madagascar.
Bitumen and other residues do	55,752	54,813	--	All from Republic of South Africa.
Bituminous mixtures do	818	1,503	--	All from France.

[1] Table prepared by Virginia A. Woodson.

[2] Less than 1/2 unit.

RWANDA

Although its contribution to the economy was less that 2% in 1983, the mining sector was the country's second leading source of export earnings, accounting for nearly 20% of total export receipts. The industry provided employment for approximately 8,500 salaried workers and 12,000 artisan miners during the year. Rwanda's exploited mineral resources were beryl, cassiterite, colombo-tantalite, gold, and wolfram. The cassiterite ore was processed at the Karuruma smelter. An estimated 90,000 tons of cassiterite ore provided the reserve base for exploitation and tin production at the foundry. Owing to a decline in export prices, a rise in production costs, mining equipment obsolescence, and effects of appreciation of the Rwandan franc, the Government mining parastatal Société Minière du Rwanda (SOMIRWA) continued to experience severe financial difficulties. SOMIRWA was 49% owned by the Rwandan Government and 51% owned by the Belgian Compagnie Geologique et Minière des Ingenieurs et Industriels Belges. SOMIRWA requested financial assistance from the European Investment Bank and the International Finance Corp. to support a $20 million[6] investment program in the mining sector for making necessary improvements in the mineral exploration, mining, and processing sectors. Negotiations for the loan were underway as of yearend. Also pending further negotiations at yearend was a loan from the UNDP for conducting a large-scale mineral exploration project using modern prospecting techniques. In May, IDA approved a $45 million credit for the Ruzizi II Regional Hydroelectric Power Project.

A cement plant at Mashyuza in the southwestern part of the country was nearing completion at yearend and was due to be onstream by mid-1984. The plant was being built with Chinese technical and financial assistance and had a proposed initial capacity of 50,000 tons per year of cement and 10,000 tons per year of quicklime. The plant should make Rwanda self-sufficient in cement, which formerly had to import all of its cement requirements. The plant was designed so that it can be expanded to 100,000 tons per day at a later date without major alterations.

SEYCHELLES

During 1983, Amoco Seychelles Co. conducted seismic testing in its search for petroleum reserves in Seychelles' waters. Evaluation of the seismic data along with aeromagnetic data gathered in 1982 was underway at yearend and was the only activity planned for the first half of 1984. Further geophysical work or drilling by Amoco Seychelles was pending, based on the results of the data evaluation. The only other mineral-related activities on Seychelles' numerous islands were small sand and gravel operations for local building needs and the collection and processing of guano for domestic use as fertilizer.

Table 8.—Seychelles: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
Copper: Metal including alloys, scrap	21	--		
Petroleum refinery products:				
Gasoline ______42-gallon barrels	--	71,613	--	All for bunkers.
Distillate fuel oil ________do	--	119,308	--	Do.
Lubricants____________do	--	840	--	Do.
Stone, sand and gravel: Dimension stone, crude and partly worked	150	--		

[1] Table prepared by Virginia A. Woodson.

Table 9.—Seychelles: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	106	133	--	United Kingdom 73; Belgium-Luxembourg 41.
Copper: Metal including alloys, semimanufactures	(2)	23	--	United Kingdom 8; Italy 7; France 5.
Iron and steel: Metal, semimanufactures	2,354	1,803	12	Republic of South Africa 677; Japan 664; United Kingdom 166.
Other: Base metals including alloys, all forms	(3)	120	1	United Kingdom 89; Republic of South Africa 10.
NONMETALS				
Cement	22,079	16,516	--	Kenya 12,964; North Korea 2,500.
Fertilizer materials: Manufactured:				
Nitrogenous	57	4,009	--	North Korea 4,000.
Unspecified and mixed	(4)	110	--	West Germany 50; Republic of South Africa 30.
Lime	11	--		
Salt and brine	309	366	--	Republic of South Africa 276; China 52.
Sodium compounds, n.e.s.: Sulfate, manufactured	31	1	--	All from United Kingdom.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	3	11	--	All from Republic of South Africa.
Worked	--	103	--	All from India.
Gravel and crushed rock	96	3	--	All from United Kingdom.
Sulfur: Sulfuric acid	8	15	--	Netherlands 7; Japan 3; United Kingdom 3.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum:				
Crude 42-gallon barrels	353	--		
Refinery products:				
Liquefied petroleum gas do.	1,566	1,635	12	Republic of South Africa 1,531.
Gasoline, motor do.	3,213	4,947	--	Yemen (Sanaa) 2,712; United Arab Emirates 2,168.
Mineral jelly and wax do.	16	16	--	Republic of South Africa 8; United Kingdom 8.
Kerosine and jet fuel do.	160,262	121,512	--	Bahrain 76,524; Djibouti 26,140.
Distillate fuel oil do.	296,967	247,620	--	Bahrain 129,468; Djibouti 56,189.
Lubricants do.	2,429	2,954	7	Singapore 2,058; France 350.
Residual fuel oil do.	--	57,136	--	Kenya 29,950; India 27,186.

[1] Table prepared by Virginia A. Woodson.
[2] Unreported quantity valued at $75,000.
[3] Unreported quantity valued at $148,000.
[4] Unreported quantity valued at $23,000.

SOMALIA

There was little change within the mineral industry of Somalia during 1983. Mineral developments were limited to small sand, gravel, and stone operations for domestic construction, production of some sea salt for domestic use, and limited sepiolite production for commercial export. Financial problems continued to plague attempts to complete the cement plant facility at Berbera in northern Somalia. Originally scheduled by the French Government for completion in 1982, the plant was expected to be completed in mid-1984. Additional financing of $3.5 million[7] was allocated by France's Central Fund for Economic Cooperation early in 1983, and equipment for the plant bought with the funding was delivered to Berbera late in the year. Creusot-Loire Entreprise, the prime contractor of the cement plant contract, estimated that 1,800 cubic meters of equipment and supplies was shipped to the plantsite during the last 2 months of 1983. Total financial assistance from France on the plant project was estimated at $22.5 million.

Late in the year, Somalia's Ministry of Mineral and Water Resources concluded negotiations with Esso Exploration Juba S.A. for a new concessional agreement on 205,000 square kilometers in southwestern

Somalia along the borders of Kenya and Ethiopia. Under the terms of the agreement, Esso Exploration Juba was obliged to drill three wells over a period of 6 years. SNEA of France also finalized negotiations late in the year and was expected to sign a formal agreement with the Somali Government in January 1984. The concession was of unspecified size and was offshore in the Mogadishu area. The Quintana Oil Co. of the United States asked for and received from the Somali Government a 1-year extension on its concession, which was due to run out during 1984, on the agreed condition that Quintana drill two exploration wells within the alloted time frame. Occidental Oil Co., which had absorbed Cities Service Oil & Gas Co.'s operation in Somalia, advised the Somali Government that it would be pulling out at yearend 1983. The Atlantic Richfield Co. announced in late 1983 that it would be drilling two exploratory wells during 1984 in the central rangelands area. Shell Oil also indicated to the Government that it would be drilling two wells in 1984, off the north coast near Las Qoray. Loan negotiations were also completed in 1983 between the Government of Somalia and the World Bank for the first phase of an estimated $42 million project to develop the Afgooye Gasfield. The project entailed drilling two development wells and constructing a pipeline to Mogadishu's electric power generating plant at Gezira.

SWAZILAND

Mineral production in Swaziland overall increased modestly during 1983. Asbestos production increased 4% over that of 1982, coal output decreased slightly, construction stone volume increased 60%, and cassiterite exploitation and production of concentrates increased. Value of all mineral production increased approximately 25% over that of 1982. Negotiations were underway during the second half of the year between Turner and Newall (T&N) and the Swazi Government for the sale of the former's 60% interest in the Havelock asbestos mines. T&N had operated the mine beginning in 1933, and it was consistently one of the country's major foreign exchange earners since that time. The existing mining lease was due to run out in 1986, and asbestos reserves within the lease area were almost depleted. These facts, coupled with the depressed condition of the international asbestos market, were cited as reasons for the impending pullout by T&N. The most likely purchaser of the mining operation will be the Swazi Government's investment fund agency, Tibyo Taka Ngwane (TTN), which already held the remaining 40% interest in the operation in 1983. Another pullout being negotiated during the year was the Anglo American Corp.'s interest in Swaziland Collieries Ltd., which operated the Mpaka coal mine. Anglo's mining lease expired in July 1983, and plans were to sell the company's 48.3% interest to the Swazi Government, also via the TTN funding agency.

Japan agreed in December to continue funding the coal exploration work ongoing since 1980 in the Lubhuku Coalfield area. As of yearend 1983, approximately 200 million tons of anthracite coal had been proved out within the field, with the quality assessed as similar to the Mpaka coal mine reserves. The Japanese International Cooperation Agency and the Geological Survey and Mines Department of Swaziland signed the agreement, which was to extend the drilling exploration program to 1985. A major boost to exporting would be provided by a proposed 800,000-ton-per-year anthracite mine financed by Shell Coal Swaziland. The location of the operation would be in the northeast Mhlume area where over 100 million tons of semianthracite reserves had been identified. The poor coal market in 1983, and prospects for the near future, will probably continue to influence an abeyance of the project. Another company evaluating coal deposits in the Mhlume Coalfield during 1983 was the Intercoal Mining & Trading Co., of Switzerland. The possibility of any expansion of the existing Mpaka coal mine in Swaziland, or any new coal developments, would depend heavily on improvements in rail transport within the country. Rehabilitation of the Machava-Matsapa section of the Swaziland Railroad continued with the total project cost of $67 million[8] being funded by the Italian Government. Also during the year, the Swazi Government began a project to build a new 60-kilometer railroad section to the Republic of

South Africa that would allow coal transport directly to Richards Bay for export. Total cost of the project was estimated at $51 million.

In September, the Swazi Government issued a diamond exploration mining license to the Trans-Hex Co. of Cape Town, Republic of South Africa. The license was for the continued survey and exploitation of diamonds and other precious stones in an area near the industrial center of Manzini. Work continued throughout the year and was nearing completion on the Langa National Brickworks near Mpaka. Upon completion, scheduled for spring of 1984, the brick plant was to have production capacity of 65 million bricks per year and to become the second largest supplier of bricks to concerns within the Republic of South Africa. Built to utilize the high-quality clay deposits within an area approximately 80 kilometers southeast of Manzini, the plant could both supply the small local demand in Swaziland and alleviate what has been a chronic shortage of bricks in the Republic of South Africa. Clay reserve estimates at the plantsite were estimated to be adequate for 50 years. The plant was 51% owned by Swaziland's TTN agency, 17.5% owned by the Roberts Construction Co., 7% by the German Development Corp., and 12.5% by the Commonwealth Development Corp. of the Republic of South Africa.

TANZANIA

New developments in the minerals sector within Tanzania for 1983 centered around the Minjingu phosphate operation, which completed its first full year of production, having started up in December of 1982, and the implementation of new mineral policies for large- and small-scale mineral developments within the country. To attract foreign investment in the mineral sector, a considered necessity for large-scale developments, a number of new incentives by the Tanzanian Government were delineated in a new mining code announced in July. Among the new incentives were suspension of customs duty and sales tax on all equipment used for prospecting, mining, and mineral processing plants. All taxes chargeable to mining operations would be applied to the Government's share of capital contribution to any joint venture. Corporation taxes would be fixed at 50%, with allowance for accelerated depreciation, and mining companies would be allowed to open special bank accounts through which to import spare parts and pay for other services without exchange restrictions. In the area of small-scale mining, the Government began setting up centers in different parts of the country late in the year for assisting small-scale mining operations in acquiring equipment, training of new mining personnel and special instruction in handling of explosives, selling of minerals exploited, and assistance in loan application preparation. The State Mining Corp. (STAMICO) was to operate the centers to be located in Morogoro, Karagwe, Mpanda, Chunya, Tarime, and Geita. Under the new system, the Government expected to deter illegal mining of gold.

A feasibility study was undertaken by the Lurgi Co. of the Federal Republic of Germany, to evaluate the iron deposits at Liganga and Mchuchume for the Tanzanian Government agency, the National Development Corp. Preliminary results of the study estimated 45 million tons of iron ore reserves at the two deposit sites, capable of supplying a proposed 1.56 million tons of ore annually to a beneficiation and iron pelletizing complex at Liganga with an annual capacity of 500,000 tons of pellets. A considerable amount of supporting infrastructure would also have to be built, including a 300-megawatt coal-fired power station at the Mchuchume coal mine. The Chinese Government was conducting a study during the year on large-scale development of the coal deposits at nearby Songwe-Kimira, which would be essential to the iron ore project. The existing Mchuchume Mine is too small an operation to supply the proposed powerplant's feedstock needs. The cost of the proposed iron ore project, including infrastructural construction, was estimated at approximately $2 billion. The cost of the Lurgi feasibility study, scheduled for completion in late spring 1984, was $280,000.

In June 1983, the United Nations Industrial Development Organization completed a study for development of soda ash deposits at Lake Natron in north-central Tanzania. Study results recommended the construction of a small plant at an estimated initial capital cost of $17 million,[9] with an annual capacity of 60,000 tons of product. Infrastructural costs for necessary road construction were not considered in the study.

The Minjingu phosphate project operated near design capacity during the year, producing approximately 165,000 tons of ore grading 24.6% P_2O_5. The ore-to-waste-rock ratio at the mine, operated two shifts per day, 7 days per week by the Government agency STAMICO, averaged 1 to 1.6 during 1983. Using dry-processing technology, the ore was upgraded to a minimum concentration of 30% P_2O_5. Because the ore was assessed as soft during exploration work and pilot testing in the late 1970's, the excavation operations at the mine infrequently used blasting during the year. Indicated reserves at Minjingu were 10 million tons of ore within 60 meters of the surface. Rear dump trucks were used to transport the broken ore approximately 1 kilometer to the beneficiation plant feed station, where it was stockpiled and blended. Ore processing included crushing, hand picking, screening, grinding, drying, and various classifying stages. Two cyclone and two bag filter units recovered fines from the dryer exhaust gas. Filter bag fines were fed to the product bin or to the waste rock stockpile, depending on the P_2O_5 content. Automatic loading devices on the product bin fed the phosphate concentrate to a fleet of eight Sisu R-142 DET truck-trailer units for transport to the city of Arusha for storage, approximately 100 kilometers from the minesite. The product was then reclaimed by Valmet wheel loaders and conveyed to railroad cars for shipment to the Tanga fertilizer plant.

UGANDA

Uganda's mineral production in 1983 remained stagnant, with modest amounts of lime, cement, and salt produced, along with small amounts of tin and tungsten from placer deposits, and copper leached from tailings piles at the Kilembe minesite. The Kilembe Mine continued to operate on a minimal care-and-maintenance basis. Seltrust Engineering, a subsidiary of British Petroleum Corp., finished a feasibility study during the year for a project to rehabilitate the Kilembe Mine, mill, and smelter near the Owen Falls powerplant. The estimated cost of the rehabilitation project was $100 million. Another feasibility study concluded during the year was for a proposed phosphate fertilizer industry utilizing the phosphate deposits at Sukulu. The study was done by the Florida-based Bearden Potter Corp., under a $4 million credit from IDA. The first phase of geophysical surveys for petroleum oil exploration in the Western Rift Valley of Uganda was completed in 1983. Further geophysical work and evaluation was planned for 1984, along with development of a petroleum code for negotiating exploration and development contracts with interested international companies. The rehabilitation of phase two of the Hima Cement Co. plant in western Uganda was completed in June 1983. The phase-two rated capacity for the plant was 600 tons per day, but as of yearend only 300 tons per day had been attained. The phase-one section of the plant remained completely shut down for the fourth year in a row. Rehabilitation work at the Tororo cement plant was nearing completion, and plans for a third cement production facility located in the Kasese District were well underway as of yearend.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Burundi francs (FBu) to U.S. dollars at the rate of FBu92.5=US$1.00.

[3] Where necessary, values have been converted from Djibouti francs (DF) to U.S. dollars at the rate of DF175=US$1.00.

[4] Where necessary, values have been converted from Ethiopian birr (EB) to U.S. dollars at the rate of EB2.07=US$1.00.

[5] Where necessary, values have been converted from Kenyan shillings (K Sh) to U.S. dollars at the rate of K Sh13.31=US$1.00.

[6] Where necessary, values have been converted from Rwandan francs (RF) to U.S. dollars at the rate of RF94.34=US$1.00.

[7] Where necessary, values have been converted from Somali shillings (So. Sh.) to U.S. dollars at the rate of So. Sh.15.79=US$1.00.

[8] Where necessary, values have been converted from Swazi emalangeni (E) to U.S. dollars at the rate of E0.90=US$1.00.

[9] Where necessary, values have been converted from Tanzanian shillings (T Sh) to U.S. dollars at the rate of T Sh11.14=US$1.00.

The Mineral Industry of Other West African Countries

By George A. Morgan[1]

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BENIN

Output of mineral products was estimated to be unchanged in 1983 from that of 1982 with the exception of petroleum. The country began production of crude oil from the Seme Oilfield, and all output was exported. Wood and charcoal constituted 72% of Benin's total energy consumption, and imported petroleum products and electric power accounted for the remainder. Cement was produced from imported clinker. The gross domestic product (GDP) was $1,061 million in 1982, the latest year for which information was available.[2]

COMMODITY REVIEW

Gold.—Exploration was underway at Perma by the U.S.S.R. as part of the United Nations development program. Gold had been produced previously at Perma, where a grade of 0.289 troy ounce of gold per ton was reported. An exploitation program for the deposit was to employ about 100 people, and output was targeted to reach 1,600 troy ounces per year. Recoverable reserves were put at 96,000 troy ounces.

Petroleum.—Output of crude oil commenced from the Seme Oilfield and all production was exported. Associated natural gas, currently flared, may be piped from the offshore field for local industry use, eliminating the need for certain imported refined product requirements.

Table 1.—Other countries of West Africa: Production of mineral commodities[1]

Country[2] and commodity[3]	1979	1980	1981	1982[p]	1983[e]
BENIN					
Cement, hydraulic[4] ____ metric tons__	250,000	284,530	297,000	314,542	315,000
Petroleum, crude _ thousand 42-gallon barrels__	--	--	--	--	1,000
Salt, marine[e] ____ metric tons__	350	400	400	100	100
Stone: Gravel[e] ____ do____	21,000	22,000	22,000	NA	NA

See footnotes at end of table.

Table 1.—Other countries of West Africa: Production of mineral commodities[1] —Continued

Country[2] and commodity[3]	1979	1980	1981	1982[p]	1983[e]
CAPE VERDE ISLANDS					
Pumice and related volcanic materials[e] metric tons	15,000	15,000	10,000	NA	10,000
Salt do.	16,196	22,134	6,445	[e]6,500	6,500
IVORY COAST					
Cement[e] [4] thousand metric tons	1,300	1,300	1,200	1,100	1,000
Diamond:					
Gem[e] thousand carats	5	--	--	--	--
Industrial[e] do.	32	--	--	--	--
Total do.	37	--	--	--	--
Petroleum:[5]					
Crude thousand 42-gallon barrels	--	[e]240	2,220	3,278	8,760
Refinery products:					
Gasoline do.	[e]2,200	2,091	1,942	1,896	NA
Kerosine and jet fuel do.	[e]1,100	1,248	899	895	
Distillate fuel oil do.	[e]3,600	2,768	3,710	3,536	
Residual fuel oil do.	[e]4,300	4,995	3,996	4,029	
Liquefied petroleum gas do.	[e]180	93	75	81	
Refinery fuel and losses do.	[e]500	482	100	803	
Total do.	[e]11,880	11,677	10,722	11,240	NA
MALI					
Cement, hydraulic metric tons	26,758	20,000	[e]20,000	27,000	20,000
Gold, mine output, metal content[e] troy ounces	[r]5,100	[r]10,000	16,000	13,000	13,000
Phosphate rock[e] metric tons	2,000	2,000	5,000	10,000	10,000
Salt[e] do.	4,500	4,500	4,500	4,500	4,500
Stone:					
Granite do.	415	--	--	--	--
Marble square meters	[r]324	500	[e]500	NA	NA
Limestone metric tons	500	4,600	[e]4,600	NA	NA
NIGER					
Cement, hydraulic do.	38,000	41,000	37,000	38,000	40,000
Coal do.	--	--	72,800	75,000	118,609
Gypsum do.	2,720	[e]2,720	[e]2,720	3,000	3,000
Molybdenum concentrate, metal content do.	100	122	113	42	40
Phosphate rock do.	1,000	1,000	6,000	1,000	1,000
Salt[e] do.	900	3,000	3,000	3,000	3,000
Stone, sand and gravel:					
Gravel cubic meters	180,000	180,000	180,000	NA	NA
Sand do.	6,000	6,000	6,000	NA	NA
Tin, mine output, metal content metric tons	98	64	55	41	40
Uranium concentrate, U_3O_8 content do.	4,410	4,869	5,137	5,014	4,041
SENEGAL					
Cement, hydraulic do.	380,688	386,234	371,600	363,470	[6]394,916
Clays: Fuller's earth (attapulgite) do.	13,000	3,978	32,973	98,999	[6]100,375
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	1,141	1,057	1,144	738	484
Jet fuel and kerosine do.	1,095	1,101	942	651	442
Distillate fuel oil do.	1,319	1,178	996	825	538
Residual fuel oil do.	2,121	1,985	1,593	1,200	566
Other do.	102	87	75	40	20
Refinery fuel and losses do.	235	188	186	147	137
Total do.	6,013	5,596	4,936	3,601	2,187
Phosphate rock and related products:					
Crude:					
Aluminum phosphate thousand metric tons	184	224	199	279	1,187
Calcium phosphate do.	1,651	1,408	1,500	902	[6]1,254
Manufactured:					
Aluminum phosphate, dehydrated do.	78	132	106	136	[6]144
Other[7] do.	10	8	5	5	[6]3
Salt[e] metric tons	140,000	140,000	140,000	160,000	[6]170,000
TOGO					
Cement products:					
Clinker thousand metric tons	[e]70	468	602	868	[6]693
Cement[8] do.	295	303	285	279	[6]232

See footnotes at end of table.

Table 1.—Other countries of West Africa: Production of mineral commodities[1] —Continued

Country[2] and commodity[3]	1979	1980	1981	1982[p]	1983[e]
TOGO —Continued					
Iron and steel:[e]					
Crude thousand metric tons	3	5	5	5	[6]2
Semimanufactures do.	10	10	10	10	--
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	673	544	--	--	--
Kerosine and jet fuel do.	432	347	--	--	--
Distillate fuel oil do.	1,417	621	--	--	--
Residual fuel oil do.	440	725	--	--	--
Minor products, refinery fuel and losses do.	[e]200	99	--	--	--
Total do.	3,162	2,336	--	--	--
Phosphate rock, beneficiated product thousand metric tons	2,920	2,933	2,215	2,800	[6]2,081
Salt[e] metric tons	650	600	600	[r]100	--
Stone: Marble, dimension square meters	NA	NA	NA	15,087	NA
UPPER VOLTA					
Phosphate rock[e] thousand tons	--	3	3	3	3

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1] Includes data available through Aug. 22, 1984.

[2] In addition to the countries listed, The Gambia and Guinea-Bissau, which are covered in the text of this chapter, presumably produce a variety of crude construction materials (clays, stone, and sand and gravel) and may produce gypsum, lime, and salt, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3] In addition to the commodities listed, a variety of crude construction materials (clays, stone, and sand and gravel) presumably is produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[4] Output based entirely on imported clinker.

[5] Data are for years ending Sept. 30 of that stated.

[6] Reported figure.

[7] Products marketed under the trade names "Balifos," "Phospal," and "P 125."

[8] One-third of domestically produced clinker from limestone mined at Tabligbo, Togo, is used domestically for cement production. Ghana and the Ivory Coast each receive one-half of the remaining clinker output. Togo also imports clinker for the production of cement by Ciment du Togo.

CAPE VERDE ISLANDS

Mineral production was confined to small quantities of building materials and salt. All fuel and mineral-related products were imported, and salt was the only product known to be exported.

Construction of a cement plant on the Island of Maio was postponed. Output would be 60,000 tons per year during the first phase of plant design. Pozzolana from deposits on the Island of Santo Antão would be the source material.

THE GAMBIA

Excluding output of unknown quantities of crude construction materials, mineral industry activity was insignificant in 1983. All requirements for petroleum products were met through imports. A small deposit of ilmenite was reportedly discovered.

GUINEA-BISSAU

Excluding production of unknown quantities of crude construction materials, there was no mineral production in 1983.

Technoexport of the U.S.S.R. signed a contract in 1977 for prospecting of bauxite mineralization in the southeast near Boe. Good-quality bauxite amounted to 71 million tons and total reserves were estimated at 110 million tons. If exploited, mine product would be treated elsewhere.

Studies were completed on phosphate mineralization at Farim in the northeast. Plans for development were terminated owing to its lower quality in comparison with other West African deposits.

Despite a maritime boundary dispute with Guinea, petroleum exploration was proceeding offshore. Société Nationale Elf Aquitaine signed a joint venture agreement with Empresa Nacionale de Pesquisa e Exploração Petroliferas e Mineiras EP (Petrominos) to explore 4,500 square kilometers. Partners include Elf Aquitaine, 22.5%; Petrominos, 25%; British Petroleum Development Ltd., 18.75%; Texaco Canada Resources Ltd., 16.87%; Wintershall Aktiengesellschaft, 11.25%; and Texaco Bissau Inc., 5.63%.

IVORY COAST

Mineral exploration and pilot plant development were the main mineral industry activities in 1983. Preparations were underway for a pilot plant to recover alluvial gold in the region of Issia. Exploitation of diamonds reportedly was planned in the region of Seguela on former mining sites.

Exploration continued in many areas, particularly for gold at Benou, Bandama-Marahoué, Tabou, Aboisso, and Seguela; for polymetallic sulfide mineralization at San Pedro, Boudoukou, and Odienné; and for uranium near Odienne and Katiola.

COMMODITY REVIEW

Diamond.—The Société pour le Developpement Minière de la Cote d'Ivoire (SODEMI) recommenced control of the diamond-producing area at Bobi in July. It outlined new zones of interest and established control of clandestine artisanal worker sites. A series of pits were dug to evaluate different structural levels with the objective of restarting production at a modest level.

The Government created the Bureau d'Achat, d'Importation et Exportation (BAIE) in January 1983. BAIE approved the export of 13,132 carats valued at $2.4 million.[3]

Gold.—SODEMI, a state organization for mineral exploration and development created in 1962, began finalization of technical and economic studies for the installation of a pilot plant at Issia. A mobile washer of 10-cubic-meter-per-hour capacity was put into operation, and the extraction and stockpiling of gold-bearing gravels commenced.

An agreement between SODEMI and Compagnie Française de Mines (Coframines) of France led to the creation of the Société de Mines d'Ity (SMI). Technical and engineering studies were completed by Fives-Cail Babcock and Krebs of France on the Ity gold deposit. Final decision on commencing output was expected in early 1984.

Petroleum.—Heurtey Industries completed expansion of the Abidjan refinery of Société Ivoirenne de Raffinage, including an atmospheric distillation unit with 41,100 barrels per day of capacity; a distillate hydrodesulfurization unit with a capacity of 5,000 barrels per day; and a sulfur recovery unit capable of 40 tons per day.

Table 2.—Ivory Coast: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, semimanufactures	1,384	878	--	Upper Volta 418; Niger 245; Senegal 50.
Copper: Metal including alloys, scrap	1,295	1,209	--	Spain 437; Hungary 255; Belgium-Luxembourg 246.
Iron and steel: Metal:				
Scrap	18,434	16,025	--	Spain 6,583; Yugoslavia 5,747; Senegal 2,277.
Semimanufactures:				
Bars, rods, angles, shapes, sections	532	590	--	Niger 251; Mali 181; Upper Volta 84.
Universals, plates, sheets	1,205	2,555	--	Mali 1,308; Niger 476.
Hoop and strip	3	--		
Rails and accessories	4,815	62	--	Nigeria 50; Niger 3.
Wire	111	110	--	Upper Volta 61; Mali 35.
Tubes, pipes, fittings	1,868	3,619	6	Niger 815; Senegal 711; France 637.
Castings and forgings, rough	9	7	--	Guinea 3; Benin 1; Senegal 1.

See footnotes at end of table.

Table 2.—Ivory Coast: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Lead: Metal including alloys:				
Scrap	844	82	--	France 60; Belgium-Luxembourg 22.
Unwrought	649	175	--	All to Republic of South Africa.
Nickel: Metal including alloys, scrap	41	5	--	All to Belgium-Luxembourg.
Titanium: Oxides	24	12	--	Liberia 6; Niger 3.
Zinc: Metal including alloys, scrap	766	594	--	France 454; Spain 93.
NONMETALS				
Cement	188,007	182,847	--	Upper Volta 120,354; Mali 57,795.
Fertilizer materials: Manufactured:				
Ammonia	528	14	--	Upper Volta 10.
Nitrogenous	--	16	--	All to Upper Volta.
Potassic	--	25	--	Niger 20; Upper Volta 5.
Unspecified and mixed	453	--		
Gypsum and plaster	118	121	--	Niger 98; Gabon 12.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	44	211	--	Ghana 153; Togo 24; Upper Volta 14.
Sulfate, manufactured	23	581	--	Ghana 477; Niger 66.
Sulfur: Sulfuric acid	64	109	--	Mali 51; Upper Volta 49.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum:				
Crude thousand 42-gallon barrels	(2)	1,715	1,421	Italy 294.
Refinery products:				
Liquefied petroleum gas do	8	9	--	Mainly to other Africa.
Gasoline do	730	587	--	Mali 311; Upper Volta 271.
Kerosine and jet fuel do	178	719	--	Mali 110; Upper Volta 85; unspecified 517.
Distillate fuel oil do	935	1,048	10	Spain 219; France 193; Mali 127.
Lubricants do	138	204	3	Ghana 60; Upper Volta 23; Niger 11.
Residual fuel oil do	1,942	3,241	28	Togo 480; Upper Volta 298; Panama 183.
Bitumen and other residues do	428	625	--	Nigeria 530; Cameroon 45.
Bituminous mixtures do	79	71	--	Nigeria 44; Upper Volta 20.

[1] Table prepared by Virginia A. Woodson.
[2] Less than 1/2 unit.

Table 3.—Ivory Coast: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	42	52	--	France 42; Republic of Korea 10.
Metal including alloys:				
Scrap	68	120	--	Gabon 44; unspecified 76.
Semimanufactures	5,624	4,429	6	Cameroon 2,639; France 715.
Copper: Metal including alloys:				
Scrap	1	3	--	All from Gabon.
Unwrought	24	21	--	All from France.
Semimanufactures	1,040	1,100	5	France 749; Belgium-Luxembourg 294.
Iron and steel: Metal: Semimanufactures:				
Bars, rods, angles, shapes, sections	39,200	29,636	4	Belgium-Luxembourg 20,482; Spain 3,988.
Universals, plates, sheets	59,553	58,140	2	France 45,537; Belgium-Luxembourg 5,264.
Hoop and strip	2,256	1,684	--	France 688; West Germany 495.
Rails and accessories	5,370	68	--	France 33; Belgium-Luxembourg 15.
Wire	1,892	1,590	--	France 993; West Germany 301.
Tubes, pipes, fittings	19,561	13,882	837	Netherlands 5,790; France 3,520; West Germany 2,379.
Castings and forgings, rough	444	277	--	France 168; Belgium-Luxembourg 99.

See footnotes at end of table.

Table 3.—Ivory Coast: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides	43	79	--	All from France.
Metal including alloys:				
Scrap	49	--		
Unwrought	73	119	--	France 115.
Semimanufactures	41	24	--	Belgium-Luxembourg 16; France 8.
Nickel: Metal including alloys, semimanufactures	508	548	13	France 325; Italy 94; Belgium-Luxembourg 46.
Titanium: Oxides	392	228	--	France 100; West Germany 40.
Zinc:				
Oxides	40	34	--	West Germany 12; France 9.
Metal including alloys:				
Scrap	107	--		
Unwrought	5,137	4,843	NA	Belgium-Luxembourg 3,242; France 1,531.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	20,995	107	--	France 105.
Artificial: Corundum	47	22	--	All from France.
Barite and witherite	19,273	15,855	--	Spain 6,001; Ireland 4,501; Morocco 4,000.
Boron materials: Crude natural borates	381	727	723	NA.
Cement	972	769,802	--	Togo 298,854; France 273,584; Belgium-Luxembourg 133,000.
Chalk	3,865	4,654	--	France 4,240; Spain 288.
Diatomite and other infusorial earth	258	163	--	France 158.
Fertilizer materials: Manufactured:				
Ammonia	2,938	4,788	--	Ireland 1,499; United Kingdom 1,349; Trinidad 1,194.
Nitrogenous	16,208	19,221	--	France 9,868; West Germany 5,250; Romania 4,103.
Phosphatic	3,065	1,000	--	Belgium-Luxembourg 600; Senegal 400.
Potassic	43,669	44,070	2,000	Spain 21,520; Netherlands 10,050.
Unspecified and mixed	15,213	22,279	22,267	West Germany 6.
Gypsum and plaster	45,237	56,896	--	Morocco 42,819; France 12,555.
Lime	7,467	9,788	--	France 7,905; Israel 1,312.
Phosphates, crude	6,308	8,785	--	Senegal 6,960; Niger 1,825.
Salt and brine	46,159	45,039	--	Senegal 41,093; West Germany 2,957.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	2,267	2,269	33	France 785; Romania 400; Italy 338.
Sulfate, manufactured	11,145	17,678	3	France 6,672; West Germany 5,014; United Kingdom 2,050.
Sulfur:				
Elemental: Crude including native and byproduct	7,797	4,023	--	France 4,011.
Sulfuric acid	3,358	2,062	--	United Kingdom 1,989.
Talc, steatite, soapstone, pyrophyllite	1,375	1,161	--	France 1,025; Norway 130.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	299	554	1	France 195; Spain 100; unspecified 165.
Coke and semicoke	129	122	--	France 97; Belgium-Luxembourg 25.
Peat including briquets and litter	76	31	--	France 28; Belgium-Luxembourg 3.
Petroleum:				
Crude thousand 42-gallon barrels	10,959	10,323	40	Nigeria 2,172; Saudi Arabia 1,914; Oman 1,269.
Refinery products:				
Liquefied petroleum gas 42-gallon barrels	109,469	127,611	--	Nigeria 60,970; France 25,706.
Gasoline do.	867,638	666,774	170	Brazil 463,310; Netherlands 78,778; Greece 24,361.
Mineral jelly and wax do.	9,200	8,869	8	West Germany 3,489; Spain 2,125; Netherlands 1,527.
Kerosine and jet fuel do.	208,180	211,784	47	Brazil 163,541; Netherlands 30,674.
Distillate fuel oil do.	440,326	291,015	--	Brazil 185,254; Netherlands 23,812; U.S.S.R. 22,649.
Lubricants do.	275,968	360,234	38,066	France 189,000; Trinidad 124,712.
Residual fuel oil do.	6,713	33,493	--	Brazil 29,177; France 4,216.
Bitumen and other residues do.	5,830	3,945	--	Belgium-Luxembourg 3,745; Netherlands 164.
Bituminous mixtures do.	2,660	1,922	1,093	France 772.

NA Not available.

[1] Table prepared by Virginia A. Woodson.

MALI

The mineral industry in 1983 was unchanged from that of 1982. Cement, gold, salt, and small quantities of phosphate rock for local consumption were the main products produced. Exploratory research continued for diamond, gold, iron ore, phosphate, and petroleum. A geological research center was set up in Bamako. The center provided computerized documentation for planning and support of Mali's geological exploration and mining.

Mali received about $7 million from France for upgrading the country's railroad system.[4] The country has had a negative trade balance for a number of years, and in 1983, imports exceeded exports by more than $145 million. Current mineral trade data, if any, was unavailable and exports were for the most part agricultural in nature.

Table 4.—Mali: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Scrap	184	22	--	All from Nigeria.
Semimanufactures	129	190	2	Nigeria 154; Togo 20; France 10.
Cobalt: Oxides and hydroxides	--	13	--	All from France.
Copper: Metal including alloys, semimanufactures	11	5,053	--	France 5,002; China 51.
Iron and steel: Metal: Semimanufactures:				
Bars, rods, angles, shapes, sections	4,153	3,535	--	France 2,683; West Germany 522; Poland 94.
Universals, plates, sheets	2,954	3,157	--	France 1,278; Belgium-Luxembourg 1,049; Poland 408.
Hoop and strip	31	17	--	All from France.
Wire	339	926	--	France 670; Netherlands 177; Senegal 64.
Tubes, pipes, fittings	1,390	531	1	France 322; Japan 93; Thailand 40.
Castings and forgings, rough	89	22	--	China 21; France 1.
Zinc: Metal including alloys:				
Scrap value	--	$7,000	--	All from Cyprus.
Semimanufactures	72	49	--	All from France.
NONMETALS				
Abrasives, n.e.s.:				
Artificial: Corundum	--	9	--	Do.
Grinding and polishing wheels and stones	3	5	--	France 4.
Cement	42,806	18,931	--	Belgium-Luxembourg 6,620; Spain 3,608; East Germany 2,140.
Clays, crude	45	43	--	West Germany 30; France 12; United Kingdom 1.
Fertilizer materials: Manufactured, nitrogenous	4,414	3,629	--	France 3,609; West Germany 20.
Lime	748	226	--	France 143.
Salt and brine	20,339	9,194	--	Senegal 6,977; Algeria 919; Ivory Coast 847; Egypt 313.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	89	23	--	West Germany 15; East Germany 5.
Sulfate, manufactured	2,631	1,104	--	West Germany 820; Netherlands 166.
Sulfur:				
Elemental: Crude including native and byproduct	8	30	--	All from West Germany.
Sulfuric acid	47	20	--	All from Belgium-Luxembourg.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	42	--	France 41; West Germany 1.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	479	532	([2])	Ivory Coast 473.
Kerosine and jet fuel do.	116	133	--	Ivory Coast 65; Senegal 40; Venezuela 6.
Distillate fuel oil do.	153	448	--	Senegal 223; Ivory Coast 185; Italy 16.
Lubricants do.	117	13	([2])	Ivory Coast 7; France 2.
Residual fuel oil do.	154	181	--	Senegal 121; Ivory Coast 53.

[1] Table prepared by Virginia A. Woodson.
[2] Less than 1/2 unit.

NIGER

The mineral industry, with its emphasis on uranium production, declined in 1983 with reduced output of that product. Reduced worldwide demand for uranium negatively impacted Niger's economy. Overall, minerals made up an estimated 84% of the value of all exports, and reduced uranium sales caused a cutback in the Government's budget and its ability to reduce foreign debt.

The GDP was estimated at $1,692 million, compared with $1,997 million in 1982.[5] Total export value was estimated at $332 million, and total import value was estimated at $383 million. Uranium exports in terms of metal equivalent were estimated at 3,600 tons compared with 3,780 tons in 1982 and 4,857 tons in 1981.

An agreement for a turnkey thermal power station to be built in Goudel was signed with a French company. Total cost was $20 million, and the plant was to consist of two diesel units of 2 megawatts each.

COMMODITY REVIEW

Coal.—Production from the Anou Araren coal mine continued to increase. Output was shipped to a thermal powerplant at Arlit, and electric energy produced was mainly consumed by the uranium industry. The plant's output was the equivalent of about 225,000 barrels of diesel fuel in 1981 and 1982, and was part of the Government's plan to become more energy self-sufficient.

Uranium.—Despite earlier investor interest in expanding uranium production, Niger continued to have only two uranium-producing companies in 1983, Société des Mines de l'Air and Compagnie Minière d'Akouta. Three other mining concerns had postponed startup of production owing to poor market conditions.

Uranium prices were reported at $68.75 per kilogram of uranate in 1983, and were to increase 6.4% in 1984. France was the principal recipient, although Niger was free to sell excess uranium to any buyer. Uranium sales alone made up 80% of total export receipts in 1982, and over 12% of budget receipts.

SENEGAL

The mineral industry experienced general improvement in 1983 with attapulgite, cement, phosphate rock, and salt production up. Output of refined petroleum products declined owing to expansion work on Senegal's only refinery. The country's first plant for producing manufactured fertilizer, along with an associated sulfuric acid and phosphoric acid plant, was completed. Mixed results were obtained in petroleum exploration, and a frontier boundary dispute with Guinea-Bissau caused delays in production.

Senegal obtained a rescheduling of $100 million of debt over a period of 7 years. The overall external debt was put at $1.2 billion.[6] The Government commenced austerity measures and cut back in spending. A 1-year, $66 million loan was obtained by Senegal from the International Monetary Fund for support of economic and financial recovery.

COMMODITY REVIEW

Clays.—In addition to byproduct production of attapulgite by the phosphate industry, attapulgite was also produced at Pout and Nianing and treated in Dakar by Compagnie des Produits Chimiques et Materiaux (Prochimat). Prochimat exports in 1983 totaled 20,385 tons of both treated and powder forms. Most was consumed locally.

Gold.—Studies completed by the Bureau de Recherches Géologiques et Minières (BRGM), since it commenced exploration for gold in 1979, indicated an estimated reserve of 370,000 troy ounces in the vicinity of Sabodalo and Kerekounda. Gold content was 0.15 troy ounce per ton of ore treated.

The Government and BRGM formed the Société Minière de Sabodalo to oversee exploration of the deposit. The Government's participation commenced at 41.42% and was to rise to 51% shortly thereafter. BRGM controlled the remainder. First-stage output from an oxidized zone was to yield 10,000 troy ounces of gold per year after 3 years. The second stage would exploit the sulfide zone at 25,700 troy ounces per year after 14 years. Startup was planned for yearend 1984.

Peat.—The Compagnie des Tourbieres du Senegal (CTS) was formed to develop peat deposits located at Niayes, Delta, Sine-Saloum, and Casamance. The initial CTS project was reviewed, and reserves were reported at 23 million cubic meters compared with the 39 million cubic meters previously estimated.

Peat production would allow the construction of two groups of electrical generators at 15 megawatts each. The peat would be briqueted for use as feed material.

Petroleum and Natural Gas.—There was no production of crude oil in Senegal, although petroleum has been found at Dome Flore offshore Casamance, and a small deposit existed about 40 kilometers offshore Dakar. Two exploration companies ceased activities owing to a disagreement between Senegal and Guinea-Bissau over offshore frontier demarcation.

Refined output by Société Africaine de Raffinage-M'Bao declined sharply owing to expansion of the refinery to a capacity of 25,700 barrels per day from 18,500 barrels per day. Total value of refined products output was $72 million compared with $131.4 million in 1982. Crude oil feedstock was from Algeria, Nigeria, and Saudi Arabia. Exports were mainly to Mali and the Ivory Coast.

Exploitation of a natural gas deposit commenced in 1982 and 312 million cubic feet was produced for generation of electric power. Originally estimated to have a total reserve of about 1.8 billion cubic feet and to last 5 years, the deposit was exhausted prematurely.

Phosphate Rock.—Overall improvement was experienced in the phosphate sector in terms of production, exports, and value despite a labor strike at the Compagnie Sénégalaise des Phosphates de Taiba in June. Total exports were 1.4 million tons, and the value per ton ranged from $22 for aluminum phosphate to $35 for calcium phosphate.

A phosphate deposit in Matain, eastern Senegal, had 40 million tons of reserves at an average depth of 10 meters. Funding for study of the deposit was obtained from Fonds d'Aide et de Cooperation of France. Cost for construction of a 1.5-million-ton-per-year facility, including extension of the existing railroad, was put at $140 million.

A 640,000-ton-per-year sulfuric acid plant and a 264,000-ton-per-year phosphoric acid plant were completed at Taiba for the Société des Industries Chimiques du Senegal. A fertilizer plant was also completed at M'Bao to produce 165,000 tons per year of diammomium phosphate and 45,000 tons per year of triple superphosphate. Phosphoric acid content was expected to be 54% P_2O_5. Feed material would be supplied by Compagnie Sénégalaise des Phosphates de Taiba based on a 15-year contract. Port facilities were completed at Dakar for importation of sulfur and export of products. About one-half of the phosphoric acid production would be purchased by a consortium of Indian companies; the remainder would be used for fertilizer production at M'Bao. Total labor for the entire project was over 400 people.

Salt.—Exports of marine salt by Société des Salins du Sine Saloum were 140,000 tons valued at $10.6 million in 1983 compared with 148,400 tons valued at $13.1 million in 1982. Local sales were 21,175 tons in 1983.

Uranium.—Indications of uranium were found in eastern Senegal. A convention was approved between the Government and Compagnie Générale des Matière Nucléaires (COGEMA) of France. COGEMA had exploration rights to 19,300 square kilometers.

TOGO

The mineral industry experienced a general decline in 1983 as output of the major products, cement and phosphate, fell. The Government sought private investors to either buy or lease its salt company operations, which were closed in December. Foreign equity was also encouraged for a proposed phosphoric acid project.

The Government relaxed control in a number of mineral product areas in order to improve their financial and competitive position. It also planned to undertake an inventory of mineral prospects with the intent of encouraging the development of the most promising ones.

COMMODITY REVIEW

Cement.—Sales of cement were estimated to be valued at $16 million in 1983. Exports were 40,772 tons and local sales were 192,536 tons. Cement prices were increased 7.5% by Government decree.

Ciment de l'Afrique de l'Ouest (CIMAO), which operated a cement clinker plant at Tabligbo using domestically produced limestone, received a $34.8 million loan from the International Bank for Reconstruction and Development (World Bank), Caisse Centrale de Cooperation Economique, and the European Investment Bank to finance technical and managerial reforms.[7] Drought conditions forced Ghana to cut electricity supplies to CIMAO at yearend, and cuts in production were expected.

Iron and Steel.—The Société Nationale de la Sidérurgie (SNS), formed as a Government-owned company in 1977 with a capacity of 20,000 tons of reinforcing rod, was leased to a foreign entrepreneur with responsibility for all operations. SNS produced only 1,905 tons of crude steel and 1,869 tons of semimanufactured products and exported 693 tons of finished products in 1983. Shortages of local scrap were reported. The Government was to receive a fixed fee and a percentage of the profits from the new operator.

Marble.—The Société Togolaise de Marbrerie et de Materiaux (SOTOMA), created in 1968, was 64% Government owned. Annual production capacity from two deposits at Guaoulou and Pagola was 3,000 tons, but 1983 output was only 1,290 tons. Exports were to Benin, Gabon, and Niger. World Bank funds were being used to review SOTOMA operations for possible reform or even closure.

Phosphate Rock.—Exports of phosphate rock were about 2 million tons in 1983, valued at $72 million. Output was down about 26% owing to lack of demand. The World Bank financed a feasibility study for construction of a $400 million phosphoric acid plant to produce 1,000 tons per day. Throughput would be about 1 million tons per year of phosphate rock.

Table 5.—Togo: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1980	1981	Destinations, 1981	
			United States	Other (principal)
METALS				
Copper: Metal including alloys, unwrought	--	17	--	All to France.
Iron and steel: Metal:				
Scrap	--	15	--	Do.
Semimanufactures: Bars, rods, angles, shapes, sections	2,710	3,513	--	Upper Volta 1,715; Benin 947; Nigeria 704.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$21	$338	--	All to Switzerland.
NONMETALS				
Chalk	242,845	287,451	--	Ghana 172,245; Ivory Coast 64,758.
Clays, crude	--	24	--	All to Senegal.
Cryolite and chiolite	30	--		
Diamond: Gem, not set or strung value, thousands	$166	$43	--	All to Switzerland.
Phosphates, crude thousand tons	2,819	2,213	([2])	Yugoslavia 622; France 542.
Precious and semiprecious stones other than diamond: Natural value, thousands	$24	$164	$23	Switzerland $102; Guinea $25.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	63	94	3	Niger 87.
Worked	--	20	--	All to Ivory Coast.
Limestone other than dimension	12	5,004	--	France 5,000; Niger 4.
Sand other than metal-bearing	--	30	--	All to Ghana.
Other: Crude	3	262	--	All to Upper Volta.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Kerosine and jet fuel 42-gallon barrels	672,762	--		
Distillate fuel oil do	708,603	61,694	NA	Spain 6,811; Italy 2,626; unspecified 50,661.
Lubricants do	712,992	231	--	All to Benin.

[1] Table prepared by Virginia A. Woodson.
[2] Less than 1/2 unit.

Table 6.—Togo: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1980	1981	Sources, 1981	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, semimanufactures	316	145	--	Cameroon 54; France 50; Ivory Coast 19.
Iron and steel: Metal:				
Scrap	--	66	--	France 60; Czechoslovakia 4.
Pig iron, cast iron, related materials	1	26	--	All from France.
Steel, primary forms	14	1,000	--	Mainly from Spain.
Semimanufactures:				
Bars, rods, angles, shapes, sections	4,329	2,659	--	France 2,265; Belgium-Luxembourg 160; Japan 145.
Universals, plates, sheets	5,611	6,695	30	Japan 4,087; France 1,514; West Germany 962.
Hoop and strip	36	46	--	West Germany 38.
Rails and accessories	117	115	--	France 102; Upper Volta 7.
Wire	364	568	--	France 297; Belgium-Luxembourg 100; Poland 85.
Tubes, pipes, fittings	72	66	--	Mainly from Belgium-Luxembourg.
Lead: Metal including alloys:				
Unwrought	--	21	--	All from Belgium-Luxembourg.
Semimanufactures	32	7	--	West Germany 5; France 2.
Titanium: Oxides	41	12	--	All from France.
Zinc: Metal including alloys, unwrought	--	989	--	Belgium-Luxembourg 867; United Kingdom 120.
NONMETALS				
Barite and witherite	42	21	--	All from France.
Cement	68,525	25,471	--	United Kingdom 13,792; France 10,580.
Chalk	141	64	--	All from France.
Clays, crude	8	41	--	Do.
Diatomite and other infusorial earth	42	113	3	France 107.
Fertilizer materials: Manufactured, nitrogenous	185	197	--	Mainly from France.
Lime	423	586	--	France 560; West Germany 26.
Magnesite	--	71	--	All from West Germany.
Phosphate, crude	--	15,200	--	All from Spain.
Pigments, mineral: Iron oxides and hydroxides, processed	--	46	--	All from France.
Salt and brine	4,992	3,193	--	Ghana 2,675; West Germany 259; Ivory Coast 134.
Stone, sand and gravel: Dimension stone:				
Crude and partly worked	283	176	--	Italy 111; China 60.
Worked	2	383	--	China 382.
Sulfur: Sulfuric acid	35	68	--	Belgium-Luxembourg 35; France 13.
Talc, steatite, soapstone, pyrophyllite	129	210	--	All from France.
Other: Crude	75	16,103	--	Greece 16,000; France 99.
MINERAL FUELS AND RELATED MATERIALS				
Coal: All grades including briquets	103	10	--	All from France.
Petroleum:				
Crude thousand 42-gallon barrels	2,592	2,190	NA	NA.
Refinery products:				
Liquefied petroleum gas do	4,083	394	--	Ivory Coast 197; Ghana 162; France 35.
Gasoline do	12,631	51,060	--	All from Saudi Arabia.
Mineral jelly and wax do	519	606	--	West Germany 504; Netherlands 94.
Kerosine and jet fuel do	81,600	64,224	720	Venezuela 19,747; Netherlands 15,314.
Distillate fuel oil do	251,275	209,783	--	Venezuela 71,324; Saudi Arabia 36,912; Netherlands 35,293.
Lubricants do	383,215	311,591	42	Saudi Arabia 166,831; Ghana 41,853; Netherlands 38,738.
Bitumen and other residues do	19,895	5,030	NA	Netherlands Antilles 3,157; France 1,539.

NA Not available.

[1] Table prepared by Virginia A. Woodson.

UPPER VOLTA

Mining industry activity continued to be confined to output of small quantities of construction materials and about 3,000 tons per year of phosphate rock for local consumption.

COMMODITY REVIEW

The World Bank was financing several mineral-related studies. One was a feasibility study on small-scale exploitation of a gold discovery at Dari-Yalogo. An economic evaluation of zinc and silver mineralization at Peckoa was to last 3 years followed by production.

Antimony.—Data were not available on artisanal production of small quantities of antimony at Marfoulou by the Société Voltaique d'Intervention Minière a Petite Echelle (SOVIMPEC). Quantity and value of exports also were not available from SOVIMPEC.

Limestone.—Deposits discovered at Tin-Hrassan were estimated at 6 million tons. Production capacity for a new quarry operation was estimated at 200,000 tons per year. However, the deposit is near the Malian border in the remote northeast of the country and would require major infrastructure for exploitation.

Manganese.—A project to exploit the Tambao deposit remained on hold owing to lack of transportation. Another deposit, located at Kiere, was to commence output in 1984 with a production capacity of 25,000 tons.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Communauté Financiére Africaine francs (CFAF) to U.S. dollars at the rate of CFAF328.7 = US$1.00 for 1982.

[3] Where necessary, values have been converted from Communauté Financiére Africaine francs (CFAF) to U.S. dollars at the rate of CFAF417.38 = US$1.00 for 1983.

[4] Where necessary, values have been converted from Mali francs (MF) to U.S. dollars at the rate of MF780 = US$1.00 for 1983.

[5] Where necessary, values have been converted from Communauté Financiére Africaine francs (CFAF) to U.S. dollars at the rate of CFAF350 = US$1.00 for 1982 and CFAF400 = US$1.00 for 1983.

[6] Where necessary, values have been converted from Communauté Financiére Africaine francs (CFAF) to U.S. dollars at the rate of CFAF336.25 = US$1.00 for 1982 and CFAF417.38 = US$1.00 for 1983.

[7] Where necessary, values have been converted from Communauté Financiére Africaine francs (CFAF) to U.S. dollars at the rate of CFAF381.1 = US$1.00 for 1983.

The Mineral Industry of the Islands of the Caribbean

By Doris M. Hyde[1]

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BAHAMAS

In the past, mining has represented between 11% and 12% of the gross domestic product (GDP). In 1982, mining contributed over $150 million to the estimated $1.4 billion GDP.[2] Overall economic growth for 1983 was projected at about 2%, primarily as a result of increased tourism. The inflation rate remained at or fell below the 1982 level of almost 4%.

The Government continued its efforts to strengthen the industrial base by improving infrastructural systems and the establishment of a free trade zone. Laws against property ownership by foreigners or foreign-owned companies were strengthened, but the prohibition was softened to allow for close family inheritance. Otherwise, Government approval must be obtained to retain property acquired through inheritance, court order, mortgage, or other means. Special consideration was granted to foreign investors seeking to promote industries beneficial to the economy.

The Continental Grain Co. announced it plans to construct a coal transshipment terminal off Grand Bahama Island. The facility, to be operated by Continental's ContiShipping Div., would have the capability of transferring almost 3 million tons of coal per year. Plans included the accommodation of bulk carriers up to 200,000 deadweight tons. The transfer terminal would primarily be used to ship U.S. coal to Far East markets.

The possibility of building a coal-to-methanol production plant, which could also use the coal transshipment facilities, was suggested and has been placed under consideration by the Government.

Table 1.—Islands of the Caribbean: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Country[2] and commodity	1979	1980	1981	1982[p]	1983[e]
BAHAMAS[3]					
Cement, hydraulic thousand tons	450	472	29	[r] [e]64	--
Petroleum refinery products[e] thousand 42-gallon barrels	69,490	67,880	68,650	66,300	61,000
Salt thousand tons	440	684	970	816	[4]862
Stone:					
Aragonite do.	3,629	3,266	3,423	3,049	3,000
Limestone, for cement manufacture do.	508	550	532	--	--
Sulfur, byproduct of petroleum[e] do.	5	5	5	5	5
BARBADOS[3]					
Gas, natural:					
Gross[e] million cubic feet	548	584	450	550	570
Marketed do.	266	311	284	[e]350	360
Petroleum:					
Crude thousand 42-gallon barrels	284	305	211	[e]265	260
Refinery products do.	1,295	1,364	1,408	[e]1,455	1,480
CUBA[3] [5]					
Cement, hydraulic thousand tons	2,613	2,831	3,292	3,163	3,400
Chromite do.	28	29	21	27	32
Cobalt[6]	1,230	1,613	1,715	[e]1,500	1,650
Copper, mine output, metal content	2,840	[r]3,305	2,908	2,645	3,000
Gas, natural:					
Gross[e] million cubic feet	1,500	1,560	1,450	2,000	2,300
Marketed do.	660	630	470	378	400
Gypsum thousand tons	91	122	130	[e]127	130
Iron and steel: Steel, crude do.	328	304	330	301	353
Lime do.	182	146	140	145	145
Nickel:					
Mine output, Ni-Co content of oxide and sulfide	32,324	[r]38,207	40,260	37,600	39,000
Metallurgical products, Ni content:[6]					
Granular oxide and powder	8,095	[r]7,926	8,487	[e]8,990	9,000
Oxide sinter	10,730	[r]11,856	12,115	[e]11,760	10,350
Sulfide	12,269	[r]16,812	17,943	[e]15,350	18,000
Total	31,094	[r]36,594	[4]38,545	[e]36,100	37,350
Nitrogen: N content of ammonia thousand tons	155	136	167	98	78
Petroleum:					
Crude[7] thousand 42-gallon barrels	1,917	1,819	1,684	3,600	5,000
Refinery products:					
Motor gasoline do.	7,412	6,936	8,410	7,310	7,500
Kerosine do.	3,221	3,416	3,330	3,550	3,700
Distillate fuel oil do.	7,912	7,869	8,084	8,150	8,200
Residual fuel oil do.	21,271	19,981	21,310	21,830	22,000
Lubricating oils do.	930	957	922	1,000	1,000
Liquefied petroleum gas do.	1,074	1,238	1,206	1,300	1,300
Other do.	2,780	3,940	3,424	[e]4,200	4,300
Total do.	44,600	44,337	46,686	47,340	48,000
Pyrite, gross weight thousand tons	29	53	33	48	50
Salt do.	122	131	161	198	201
Sulfur:[e]					
S content of pyrite do.	12	22	14	20	20
Byproduct of petroleum do.	8	8	8	8	8
Total do.	20	30	22	28	28
DOMINICAN REPUBLIC[3]					
Aluminum: Bauxite, dry equivalent, gross weight do.	[r]635	[r]606	457	141	--
Cement, hydraulic do.	886	1,015	951	[r] [e]910	900
Copper, mine output do.	3	3	3	[e]3	3
Gold thousand troy ounces	353	370	408	[r] [e]380	348
Gypsum:					
For cement manufacture thousand tons	173	185	180	[e]180	180
Other do.	[e]2	50	24	[e]30	30
Iron and steel: Ferroalloys, ferronickel[8]	[r]65,445	[r]46,614	49,073	14,161	54,000
Lime	37,935	[e]40,000	[e]40,000	[e]40,000	40,000
Mercury 76-pound flasks	281	159	77	49	40
Nickel:[8]					
Mine output, metal content	[e]25,111	16,347	18,689	5,296	20,200
Metal, smelter, Ni content of ferronickel shipments	24,553	16,552	18,679	5,484	20,200

See footnotes at end of table.

Table 1.—Islands of the Caribbean: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country[2] and commodity	1979	1980	1981	1982[p]	1983[e]
DOMINICAN REPUBLIC[3] —Continued					
Petroleum refinery products thousand 42-gallon barrels	9,324	9,841	10,529	10,250	10,000
Salt	[e]38,000	55,556	[e]60,000	[e]60,000	60,000
Silver thousand troy ounces	2,276	1,623	2,034	2,200	1,350
GUADELOUPE[3]					
Abrasives, natural: Pumice thousand tons	200	250	240	[e]240	240
Cement do.	143	183	160	[e]160	160
HAITI[3]					
Aluminum: Bauxite, dry equivalent, gross weight do.	584	312	427	377	--
Cement, hydraulic do.	237	243	229	213	220
JAMAICA[3]					
Aluminum:					
Bauxite, dry equivalent, gross weight do.	11,618	12,054	11,682	8,361	7,300
Alumina do.	2,094	2,456	2,556	1,758	[4]1,907
Cement, hydraulic do.	226	144	165	211	[4]272
Gypsum	47,600	105,300	186,758	180,000	[4]108,000
Lead, refined (secondary)[e]	2,000	1,000	1,000	1,000	1,000
Lime thousand tons	204	159	133	114	[4]121
Petroleum refinery products thousand 42-gallon barrels	9,922	8,201	5,758	[r] [e]6,100	[4]8,366
MARTINIQUE[3]					
Cement, hydraulic thousand tons	144	180	180	[e]200	200
Petroleum refinery products thousand 42-gallon barrels	4,011	3,990	4,357	[e]4,320	4,300
Pumice, converted from cubic meters thousand tons	166	153	156	[e]156	150
NETHERLANDS ANTILLES[3]					
Petroleum refinery products[e] thousand 42-gallon barrels	209,330	214,350	217,700	207,200	200,000
Phosphate rock thousand tons	49	--	--	--	--
Salt[e] do.	400	400	400	400	400
Sulfur, byproduct of petroleum[e] do.	91	91	90	90	90
ST. VINCENT[3]					
Salt do.	50	50	50	[e]50	50
TRINIDAD AND TOBAGO[3]					
Asphalt, natural do.	56	41	23	30	30
Cement, hydraulic do.	218	186	139	189	190
Gas, natural:					
Gross million cubic feet	169,740	197,860	195,399	206,237	220,460
Marketed do.	113,000	128,800	137,600	[e]140,000	165,300
Iron and steel:					
Iron, sponge thousand tons	--	22	180	218	304
Steel, crude do.	--	3	53	171	219
Semimanufactures (wire rod) do.	--	--	29	124	160
Lead, refined (secondary)[e]	2,000	2,000	2,000	2,000	2,000
Natural gas liquids thousand 42-gallon barrels	39	40	[e]40	35	40
Nitrogen: N content of ammonia	388,654	459,235	348,340	704,600	981,400
Petroleum:					
Crude thousand 42-gallon barrels	78,249	77,616	69,112	64,618	58,300
Refinery products:					
Gasoline:					
Aviation do.	271	375	284	200	NA
Other do.	14,827	15,241	12,822	12,000	NA
Kerosine do.	3,245	3,247	2,145	2,000	NA
Jet fuel do.	2,521	3,202	1,264	1,100	NA
Distillate fuel oil do.	11,741	13,991	10,279	9,000	NA
Residual fuel oil do.	43,521	42,286	29,613	25,000	NA
Lubricants do.	686	1,012	787	700	NA
Other:					
Liquefied petroleum gas do.	759	869	901	900	NA
Asphalt do.	276	273	403	400	NA
Unspecified do.	2,490	2,424	2,150	2,000	NA
Refinery fuel and losses do.	2,526	1,680	2,696	1,807	NA
Total do.	82,863	84,600	63,344	55,107	26,900

See footnotes at end of table.

Table 1.—Islands of the Caribbean: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country[2] and commodity	1979	1980	1981	1982[p]	1983[e]
TRINIDAD AND TOBAGO[3] —Continued					
Sulfur, byproduct of petroleum[9] thousand tons	77	57	44	40	20

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1] Table includes data available through June 1, 1984.

[2] In addition to the countries listed, Antigua, Bermuda, Dominica, Grenada, Montserrat, and St. Lucia presumably produced crude construction materials (clays, sand and gravel, and stone), but output is not always reported, and information is inadequate to make reliable estimates of output levels. Antigua also has a petroleum refinery that was closed in 1976 but became operational again for a short period in 1982.

[3] In addition to the commodities listed, crude construction materials (lime, salt, stone, sand and gravel, etc.) may also be produced, but data on such production are not always available and information is sometimes inadequate to make reliable estimates of output levels.

[4] Reported figure.

[5] In addition to the commodities listed, iron ore and manganese ore presumably were produced during the period covered by this table, but available information is inadequate to make reliable estimates of output levels.

[6] Annario Estadistico de Cuba provides figures on nickel-cobalt content of granular and powder oxide, oxide sinter, and sulfide production. Using an average cobalt content in these individual products of 0.9% in total granular and powder oxide, 1.1% in total oxide sinter, and 4.5% in total sulfide, the cobalt content of reported Ni-Co production was determined as being 1.165% of granular and powder oxide, 1.21% of oxide sinter, and 7.56% of sulfide. The remainder of reported figures would represent the nickel content.

[7] Cuba reports crude oil production in metric tons. A conversion to barrels was made using a factor of 6.652. Some published production figures indicate a need to use a conversion factor of 7.3 to balance the units of measurement. However, pending more accurate information, the original factor will continue to be used in this publication.

[8] The Dominican Republic reports gross weight of ferronickel production. When official data are not available, figures for nickel content of mine production is determined from an average of 37.4% Ni contained in ferronickel production. Nickel content of ferronickel shipments is obtained from Falconbridge Dominicana C. por A. annual reports.

[9] Limited quantities of sulfur as a byproduct of natural gas may also be produced.

BARBADOS

The mining sector has traditionally made a negligible contribution to the estimated $955 million[3] GDP. The Barbadian economy is sensitive to world economic fluctuations, which have been recessionary during the past few years. Competition from neighboring countries for foreign exchange earnings intensified and receipts from exports and tourism diminished. In real terms, the 1982 GDP declined by almost 4%. During 1983, a gradual but uneven economic improvement in some Western industrialized nations began to slowly be reflected in Barbados. Overall, the economy showed no growth. A 2% growth was projected for 1984, partly because of trade opportunities and financial benefits derived from the United States Caribbean Basin Initiative (CBI).

The Arawak Cement Co., a joint Barbados-Trinidad and Tobago cement project in northern Barbados, was preparing to pass from the construction phase to the operation phase in mid-1984. The $100 million plant was designed to produce 300,000 tons of cement per year, two-thirds of which had been allocated for export markets.

Petro-Canada International Assistance Corp. extended its oil exploration assistance program with the Barbados National Oil Co. (NOC). The agreement provided for an additional $4 million grant to finance the drilling of up to 10 shallow wildcats. Petro-Canada has assisted NOC in operating the Woodbourne Oilfield since its acquisition from Mobil Oil Exploration Barbados Ltd. in late 1982. A $9 million long-term line of credit from the Venezuelan Investment Fund was obtained to upgrade facilities at Woodbourne. Crude oil production from the Woodbourne Field, the sole producing field, did not increase to the 1,200-barrel-per-day rate projected for 1983. Instead, it actually averaged about 1,100 barrels per day.

Cluff Oil Ltd., a British company, obtained an offshore seismic survey license covering 468 square miles. The company planned a 2-year program for the area, which has been identified as containing a promising hydrocarbon structure. Favorable results could open the possibility of granting exploration rights to other companies.

The 3,000-barrel-per-day Mobil oil refinery continued to operate. Assessment studies were reportedly made on the cost effectiveness of closing the refinery and transporting Barbadian crude oil production to Trinidad and Tobago for processing. Additional petroleum product needs were thought to be more economically obtainable by their direct purchase from Trinidad and

Tobago instead of refining imported crude oil in Barbados. However, assurances as to price and continuity of supply appeared to be stumbling blocks, as well as the assumption of the additional financial burdens that would be imposed on the Government by the purchase of the Mobil refinery itself.

CUBA

Cuba's primary mineral product, nickel-cobalt in oxide and sulfide forms, became the focus of some international discussions during 1983. In 1962, the United States imposed a trade embargo against the import of Cuban raw materials, either directly or as components of products manufactured in other countries. In 1983, a new certification process was established with some foreign industries exporting products to the United States that might contain nickel imported from Cuba. The United States has imported steel and nickel metal and alloy products from several countries, including the Federal Republic of Germany, France, Italy, Japan, the Netherlands, and the U.S.S.R., all of which have been direct importers of Cuban nickel. Most of the required certification agreements were concluded in 1983, but the import ban remained in effect against the U.S.S.R. pending an acceptable conclusion to the certification discussions. This recent, more tightly controlled certification process was reportedly motivated by a Western nickel producer's report that brought possible infractions of the Cuban trade embargo to the attention of the U.S. Government.

The petroleum, mining, and metallurgical industries contribute about 3% to Cuba's global social product (GSP), an economic measurement roughly equivalent to the gross national product. In 1983, the GSP reached over $28 billion[4] and represented an estimated 5% real growth over that of 1982. This was double the rate projected early in the year.

Cuban authorities were negotiating with foreign creditor lending institutions to reschedule payment of about $810 million in short- and medium-term loans. Although the rescheduling was expected to occur, probably early in 1984, certain economic disciplines or performance standards were also expected to be imposed on Cuba by the creditors, perhaps reminiscent of guidelines normally imposed by the International Monetary Fund (IMF).

In 1982, Cuba passed Legislative Decree No. 50, known as the Joint Venture Law, that established a basis for the formation of commercial ventures in partnership with foreign investors. An analysis of the apparently negative investor response to Cuba's overture appeared in The Latin American Times in 1983.[5]

Cuba's need for about 120,000 barrels per day of imported crude oil was the basis for the reactivation of an exchange agreement between Venezuela and the Soviet Union. The agreement was designed to mutually reduce oil transportation costs. The U.S.S.R. would supply 20,000 barrels per day to a Gelsenkirchen, Federal Republic of Germany, refinery owned jointly by Petróleos de Venezuela S.A. and Veba AG, and Venezuela would provide a reciprocal amount of crude oil to Cuba.

Spain indicated an interest in participating in a Cuban-based crude oil terminal, storage, and distribution center project under preliminary development study by Soviet technicians. A Spanish trade mission was expected to begin discussions regarding this and other projects during 1984. The Spanish interest was alleged to be directed toward providing technical assistance and equipment rather than possible financial involvement. The crude oil terminal project reportedly would include the construction of a 3-dock port to accommodate tankers over 100,000 deadweight tons, handling equipment, 20 storage tanks, and distribution pipelines to Havana and Cienfuegos.

The Council for Mutual Economic Assistance reported that scientists from Czechoslovakia, the German Democratic Republic, and the U.S.S.R. discovered Cuban mineral deposits containing lead, zinc, copper, and molybdenum. The report also mentioned the discoveries of chromite and phosphoritic ores, although specifics as to locations and deposit sizes were not provided.

The Matahambre Mines in Pinar del Río Province have produced copper from chalcopyrite ore for 70 years. Cable cars are used to move ore to the concentration plant and from there to the shipping port of Santa Lucía. In 1983, the mines reached the 1,500-meter level, designated "Level 45." The mines were reported to contain more than 100 kilometers of galleries. Preliminary information indicated that the production of 18% copper concentrate doubled that of

1982, while the output of 30% copper concentrate remained about the same.

Nickel sulfide production was reported to have resumed at normal rates in 1983 after rehabilitation work on two existing acid production lines and the construction of a third line at the Comandante Pedro Sotto Alba plant at Moa.

During 1983, Cuba invested more than $54 million toward the construction of its two new nickel plants and associated support facilities. More than $33 million of this investment went to the Combinado Niquelífero de Punta Gorda, the new nickel oxide plant 4 kilometers from the town of Moa. The plant was scheduled to begin tests by yearend 1984, perhaps as early as October, and was expected to initiate regular production in early 1985.

In May 1983, trade journals reported that because Cuba was concentrating its resources on Punta Gorda, construction had been halted on the Las Camariocas nickel oxide plant (CAME I), 11 kilometers from Moa on the Moa-Baracoa Highway. The Cuban newspaper, Granma, reported that site preparation was underway and cover was being installed to protect the delivered supplies and equipment needed for infrastructural development.

Published reports indicate that significant new crude oil reserves have been discovered in Cuba, and that additional production increases can be expected in the near future as a result of an intensified exploration and drilling program. Evidence for this first appeared in Cuba's published monthly statistical reviews when a sharp production increase was shown beginning late in 1981.[6] The new production was thought to be primarily from northern coastal fields east of Havana.

The arrival of Soviet-manufactured drilling rigs capable of drilling to depths of 16,000 feet was reported. Offshore activity was indicated by the presence of a large drilling platform to the west of Havana.

A trade journal[7] reported that Cuba's increased production resulted from successful directional turbodrilling to various offshore targets along the northern coast, especially east of Santa Cruz del Norte, but also at Guanabo. In these two areas, maximum well depth was reported as frequently between 6,500 and 9,800 feet, although some pay zones were found as shallow as 459 feet. The directional drilling has evidently allowed new discoveries to be brought onstream at an average time lapse of 6 months from the date of rigging.

Drilling has also accelerated at Varadero, where some production wells have been shut in because of inadequate means to transport the crude oil to the Havana refinery. Future plans call for a pipeline to connect the north coastal fields to the refinery.

Crude oil reserve figures have not been made available, but Varadero is reportedly the largest field in the North Cuban Basin. Oil-bearing structures in the Varadero and two other nearby fields extend offshore. The North Cuban Basin extends along the coast for at least 620 miles and ranges in width from 60 to 90 miles, with only 6 to 37 miles of this width onshore.

DOMINICAN REPUBLIC

The Dominican Republic continued its efforts to expand the role of the minerals sector in the national economy. Because of weak world market conditions, bauxite was not mined during the year, and the nickel mine and ferronickel plant produced at depressed levels. Deposits of gold, base metals, and nonmetallic minerals have been located and may represent distant future mining opportunities.

In an effort to revitalize investment and promote development in the minerals sector, the Government instituted a new mining policy. A 1973 Presidential decree has essentially restricted all mineral exploration efforts to the state. The 1983 decree identified specific areas as reserved for the state and assigned responsibility for each area's exploration and study to a particular Government entity. Nonreserved areas were declared open for private exploration concessions in accordance with the 1971 mining code. The new policy defined the objective of the Government in any mineral resource development project as one promoting mutual benefit through participation between the public and private sector, a merging of resource ownership with technical experience and capital investment. However, the new policy failed to stimulate private investment during 1983. The United Nations and the U.S. Geological Survey offered some recommendations for modifying the policy, such as eliminating the concept of special mining areas reserved for the state, reducing royalty payments, and

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revising the tax structure to permit increased investor profit.

Midyear projections on economic performance fell short of earlier Government growth expectations. Low world prices for traditional exports continued to outweigh increased import restrictions, and a $317 million balance-of-trade deficit was expected. The GDP was projected at just under $8 billion,[8] with real growth held to 1% or less.

The export values of the major mineral products are shown in the following table, in million dollars:

Commodity	1979	1980	1981	1982	1983[e]
Bauxite	$21	$19	$16	$5	--
Doré	128	260	208	164	$161
Ferronickel	123	101	111	24	83
Total	272	380	335	193	244
Share of total exports	31%	40%	28%	25%	28%

[e] Estimated.

Source: U.S. Department of State Airgram A-6, Mar. 22, 1984.

Petroleum import costs dropped to about $420 million from the 1982 level of $460 million. Lower petroleum prices and reduced needs for the ferronickel plant were responsible for the 9% decline in cost. Petroleum accounted for more than 35% of total import costs.

The Government intensified its campaign to attract foreign investors by officially initiating a new mining policy, issued as Presidential Decree 900 on March 19, 1983. The decree sought to broaden the role of private sector investment in mineral exploration and exploitation and to redefine the role of the state. All previous decrees concerning mining were derogated. This included a 1973 decree (Decree 3528) that restricted all mineral exploration activity to state entities. A joint English-Spanish publication was issued that detailed guidelines for mining investment in the Dominican Republic and included a leaflet describing the new mining policy.[9]

Decree 900 reaffirmed the state's absolute ownership of all subsoil mineral resources. It redefined and identified certain areas of the country as Fiscal Mining Reserves (FMR), where national interest dictates that any minerals should be developed directly by the state, or through special contracts with international agencies, friendly foreign nations, or private companies. The FMR included all known and potential gold-producing areas, all known amber and larimar deposits, the Sánchez lignite deposits, certain base metal deposits, and major salt, gypsum, and marble deposits.

The decree divided the exploration responsibility for FMR among four agencies. Areas not included in the FMR were opened for private sector participation by means of concessions granted in accordance with Mining Law 146 of June 4, 1971. Objectives of the new mining policy included new employment opportunities through small nonmetallic mining operations and artisan activities, the provision of raw materials for small industries, increased export opportunities, and decreased raw material import requirements. All exports of marbles, larimar, and amber were prohibited unless the crude product was further processed locally.

The role of the National Commission of Mining Policy was defined as that of a consultation agency to the Executive Power to oversee and advise on mining policy. Another commission function was the evaluation of proposals for exploration and exploitation agreements between the Dominican Republic and public or private entities. The establishment of a Secretariat of Mines and Energy was proposed to promote the profitable and rational development of mineral and fuel resources. The Secretariat would merge the responsibilities of the Directorate General of Mining and Hydrocarbons and the National Commission of Mining Policy. Also proposed was the creation of a state-owned mining corporation, the Corporación Minera Estatal, that would own the state's share of stock in mining ventures and be responsible for implementing the industrial and commercial operations of the state in mineral and petroleum operations.

The Government began to expand its exploration efforts in the FMR areas as outlined in Decree 900. An exploration agreement was concluded with the Japan International Cooperation Agency. The two Governments planned to jointly evaluate 2,000 square kilometers in the Cordillera Central, particularly the three FMR areas known as Yataco, Mata Grande, and Las Cañitas where base metals are known to occur. Decree 900 assigned the General Mining Directorate responsibility for these areas. The work was expected to proceed for 3 years at a total cost of $1.5 million.

The Federal Republic of Germany, through its State of Lower Saxony Geological Survey and the West German Federal bureau, Bundesanstalt für Grund und Rohrstoffe (BGR), agreed to begin a program of geological mapping and preliminary evaluation of metallic and nonmetallic prospects of the San Juan de la Maguana area in the Cordillera Central. The 3-year program was expected to cost $1.5 million.

The U.S. Geological Survey began an offshore gold placer exploration program in the northeastern coastal areas of Cape Francés Viejo and Cape Rafael. This program was part of an initial 3-year cooperative effort to define areas with economic mineral potential and was to include geologic mapping and geochemical sampling. The program may be extended for an additional 2 years.

The Aluminum Co. of America (Alcoa) did not mine bauxite from its concession at Pedernales and indicated that production would not resume in the near future. Alcoa's limestone production was 262,588 tons, a 14% increase over that of 1982. Export sales declined from 231,560 tons valued at $1.5 million in 1982 to 168,044 tons valued at about $1 million in 1983.

Rosario Dominicana S.A., which operates the Pueblo Viejo gold and silver mine at Cotuí, had its new $5 million refinery ready to go on-stream in March and produce gold and silver bullion to London Metal Exchange specifications. The refinery, located in Santo Domingo, can process about 75 tons of doré ingots per year. It was not activated during 1983 because it was more economical to continue sending doré to Switzerland and the United States for refining. The doré feedstock averages 80% silver and 20% gold. The refinery was expected to produce 0.999 quality gold and 99.5 quality silver bullion with traces of platinum, selenium, and tellurium reportedly present in the bullion.

The oxide ore reserves at the Pueblo Viejo Mine were expected to be exhausted by 1989. A sulfide ore body underlies the oxide, but an economical metallurgical process to extract the precious metals has not yet been proven. To this end, Rosario engaged Fluor Mining and Metals Co. to conduct a feasibility study. Study results were reported as favorable, and funding was approved for the construction of a pilot plant to test the metallurgical process. The cost of developing the sulfide reserves was tentatively placed as high as $300 million. Production costs per ounce of gold would be well over double the present cost for the oxide ore. Processing the sulfide ore would also entail disposing of 1,500 to 2,000 tons per day of sulfuric acid byproduct. The sulfuric acid could be exported, but could also be used as feedstock for the local production of superphosphate fertilizer.

Rosario continued its efforts to locate additional precious metal deposits. Exploration and evaluation work was underway on three prospects. In cooperation with the United Nations Development Program (UNDP), Rosario continued an evaluation of the placer gold deposits and potential for vein-type gold occurrences in the Miches area of the eastern Cordillera. UNDP was also cooperating in a placer gold project in Mao-Bulla-Monción areas of central Valverde and eastern Santiago Rodríguez Provinces where terraced structures were under study. At Villa Altagracia, in the Madrigal region of San Cristóbal Province, the potential of gold placer deposits continued to be evaluated. The area would be inundated when the proposed Madrigal Dam is built.

Falconbridge Dominicana C. por A. (Falcondo) confirmed that the Cerro de Maimon Prospect in its Quisqueya No. 1 concession contains over 3 million tons of ore averaging 4% copper, almost 2% zinc, 1.3 ounces of silver, and 0.014 troy ounce of gold per ton. Metallurgical and prefeasibility studies were to be undertaken. Exploration was continued because development would probably require additional reserves. The Quisqueya concession area includes Falcondo's nickel mine and ferronickel plant. The copper mineralization adjoins and may extend into Rosario's Pueblo Viejo concession area.

Falcondo operated its Bonao ferronickel plant at about 60% of capacity during 1983, but low nickel market prices continued and this subsidiary of the Canadian firm Falconbridge Ltd. remained unprofitable. The metal transfer price to the parent firm was $1.99 per pound, up from $1.49 in 1982. Although operating costs were estimated at $1.90 per pound, servicing a long-term debt of $200 million increased overall cost to about $2.70 per pound. Nickel laterite occurrences have been noted elsewhere in the Dominican Republic.

Carbones S.A. continued with its prefeasibility studies on the Sánchez lignite deposits. Recoverable reserves were tentatively placed at 46 million tons. However, some formidable problems need to be dealt with prior to exploitation. Carbones planned to seek assistance from foreign consultants.

The Sánchez area is complex geologically and highly faulted. Both of these conditions inhibit an accurate measurement of reserves and complicate mining techniques. The lignite beds are capped by unstable water-saturated overburden, which would probably eliminate underground mining. Open pit techniques would require extensive stripping and reduce the volume of recoverable lignite. The inflow of water into an open pit mine, particularly if mining is extended below sea level, could be another obstacle.

HAITI

Reported mineral production in Haiti was limited to construction-oriented materials.

Over the years, the UNDP has undertaken several mineral exploration projects in Haiti. One on-going program scheduled for completion in 1983 involved an evaluation of three volcanic gold-bearing zones in northern Haiti. The latest UNDP project recommendation was for exploration and evaluation of the precious and base metal potential of four selected zones in the Gros Morne and Perches areas of northern Haiti. Preliminary work would require about 2 years and cost $1 million.

Lignite deposits were again reported to be the subject of a feasibility study, this time by a Brazilian technical mission. The last reported study was in 1980 by the Federal Republic of Germany when BGR planned a 1981-82 study of lignite in the Maissade region. The Brazilian study was to include the Maissade lignite deposits and was evidently part of a $70 million agreement whereby Brazil would assist Haiti in developing a national energy plan.

Included in the Brazilian study was an evaluation of the prospects for reopening a closed gold mine at Milot, south of Cap-Haïtien in northern Haiti. The Milot area was part of the UNDP evaluation mentioned above as scheduled to terminate in March 1983.

It has been generally acknowledged that Haiti may have the mineral resources necessary to establish viable mining operations. The considerable amount of exploration work and feasibility studies necessary to develop this potential preclude any short-term expectations of new contributions to the national economy from the mining sector.

JAMAICA

A healthy mineral sector, represented by bauxite and alumina, has been central to Jamaica's economic growth prospects. A declining world demand for aluminum, especially during the past 2 years, has caused producers to cut back their Jamaican bauxite production and placed severe strains on Jamaica's economy through reduced revenue earnings, the availability of foreign exchange, and all the related consequences of increased unemployment, currency devaluation, and increased borrowing to accommodate budget demands and import payments.

During the latter part of 1983, the world aluminum industry began to respond positively to prior production cutbacks and stockpiled inventory reductions. Although total Jamaican bauxite production fell again, the year ended with positive expectations for 1984 as a result of improved market projections, an anticipated new bauxite production levy agreement, new trade agreements, and an alumina company's announced intention to reopen closed production capability.

Preliminary information indicated Jamaica's GDP reached over $3 billion[10] and grew by 1% in real terms, only a slight improvement over that of 1982. Unemployment was 26%, and the rate of inflation more than doubled to over 18%. Devaluation of the parallel market exchange rate and the formal recognition and shift of most consumer items (except essential food, fertilizer, and certain Government payments) to this rate were expected to temporarily slow economic growth but prove attractive to new investment. In November, the official exchange rate was devalued by 43% to comply with IMF conditions for credits.

The Government expected that the trade advantages offered through the CBI would be a positive factor in attracting new investment to Jamaica. Countertrade and barter agreements were being negotiated more frequently to provide expanded market opportunities and protect against further cutbacks of bauxite and alumina production. The agreements also relieve the Government of the necessity of using scarce foreign exchange to pay for imports, thus providing the opportunity to acquire needed equipment and supplies that otherwise might be foregone completely or increase borrowing requirements.

In December, the Government began new levy negotiations with the five companies engaged in bauxite mining and alumina production. The old levy agreement expired at yearend 1983. The Government was expected to offer incentives for production above base levels and for additional investment but still assure a fair and predictable minimum level of revenue to the state. The producing companies would prefer the abolishment of the levy, which they consider cost inflating and a prime reason for making Jamaican bauxite and alumina noncompetitive with that available in other countries.

Jamaica has recognized the precariousness of its economic dependence on a single mineral resource. The prominence of bauxite has overshadowed exploration for other mineral resources, and production has been limited to the quarrying of industrial minerals for the domestic construction industry and some export to neighboring countries. Geologically, Jamaica has an environment favorable to the occurrence of base metals and precious metals. There has been very little investigative work on metallic mineral prospects in Jamaica.

The high cost of imported petroleum for the domestic economy prompted price increases designed to encourage reduced consumption. Exclusive of petroleum used and purchased by the bauxite and alumina sector, Jamaica's 1982 domestic oil import cost reached almost $318 million, an amount equivalent to about 22% of total import costs and nearly 41% of total export earnings. Consumption in 1983 was about the same. Effective the end of December 1983, petroleum product costs were increased from 20% to 50% above the June prices. Electricity rates were set to increase 40% at the end of January 1984. The Jamaica Public Service Co. must now pay for its fuel oil at the new floating exchange rate, instead of at the official rate.

A feasibility study for converting the oil-fired power system to coal suggested a phased approach that would be better suited to Jamaica's ability to cope with the high cost of whole system conversion. The local cement plant had undertaken an expansion and coal conversion program with the assistance of a $70 million loan from the Inter-American Development Bank. Jamaican plans included increased hydroelectric power, the use of domestic peat resources, and imported coal as alternative fuels to petroleum. The Government projected a cost of $320 million to develop the first phase of its conversion program.

Jamalco, majority owned by Alcoa Minerals of Jamaica Inc., announced that it would reopen the second unit of its Clarendon alumina refinery in mid-1984. The unit was deactivated in late 1981 and alumina output reduced to about 365,000 tons per year. Reactivation was expected to bring the plant back to its full capacity of 550,000 tons per year. Alcoa Minerals also announced it would spend almost $15 million on modifications to improve plant efficiency. These improvements were expected to increase capacity to about 800,000 tons per year.

Both Alcoa Minerals and Alcan Jamaica Co. expected the conversion of their alumina plants from fuel oil to coal to be completed by 1987.

In May, after losing its bid to supply a portion of a new 1-million-ton bauxite sale to the U.S. Government, Jamaica Reynolds Bauxite Partners Ltd. reduced its work force to 120 employees. It continued mining and stockpiling bauxite ore in Jamaica at the rate of about 500,000 tons per year. Another sale to the U.S. Government for 1 million tons of bauxite brought total U.S. purchases of Jamaican bauxite during the last 2 years to 3.6 million tons. These purchases were partly for cash and partly as barter exchanges for agricultural products. Early in the year, Jamaica finalized its negotiations with the Chrysler Corp. to countertrade 50,000 tons of alumina for vehicles.

A study of data gathered during the onshore petroleum exploration program funded by an Inter-American Development Bank loan was completed. The loan was reformulated to continue exploration that included the drilling of three stratigraphic tests at Ecclesdown, eastern Montego Bay, and east of Negril. A seismic program was planned for these locations as well as a geologic mapping program that would also include the Duckenfield Hall and Moneague areas. The onshore prospect areas have proved to be geologically complex and require additional investigative work. This second exploratory phase and subsequent evaluation was expected to continue through 1985.

Union Texas Petroleum Co. and Azienda

Generali Italiana Petroli S.p.A. (AGIP) relinquished their concessions on the Pedro Banks, and Jamaica sought to interest other companies in offshore exploration. Information from the unsuccessful Union Texas-AGIP well and from seismic lines run by the Petroleum Corp. of Jamaica with the assistance of Petro-Canada was studied to determine the most promising areas for future drilling.

Table 2.—Jamaica: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate thousand tons	5,371	4,080	4,080	
Oxides and hydroxides do	[r]2,545	1,753	182	Canada 427; United Kingdom 402; Norway 309.
Metal including alloys:				
Scrap	596	504	290	Canada 178; United Kingdom 36.
Semimanufactures	429	411	--	Trinidad and Tobago 369; St. Lucia 22.
Copper: Metal including alloys, scrap	165	208	6	West Germany 75; United Kingdom 53; Netherlands 23.
Gold: Waste and sweepings value	$69,800	--		
Iron and steel: Metal:				
Scrap	19	86	67	West Germany 19.
Semimanufactures:				
Bars, rods, angles, shapes, sections	179	20	--	All to Trinidad and Tobago.
Universals, plates, sheets	3,933	4,926	--	Trinidad and Tobago 4,567; Grenada 94; St. Lucia 86.
Tubes, pipes, fittings	532	47	--	Trinidad and Tobago 45; Dominica 1; St. Lucia 1.
Castings and forgings, rough	9	29	--	Mainly to Trinidad and Tobago.
Silver: Waste and sweepings value	$509	NA		
Tin: Metal including alloys:				
Scrap	444	414	414	
Semimanufactures	86	95	95	
Zinc: Metal including alloys, scrap	9	19	--	All to United Kingdom.
NONMETALS				
Gypsum and plaster	139,496	87,634	12,282	Colombia 47,947; Trinidad and Tobago 15,294; Haiti 12,097.
Salt and brine thousand tons	1,141	1,562	--	Trinidad and Tobago 1,407; Haiti 120.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum:				
Crude 42-gallon barrels	--	130,960	--	All to French Guiana.
Refinery products:				
Kerosine and jet fuel do	4,541	106,292	7,554	Netherlands 98,737.
Distillate fuel oil do	32,870	120,104	--	All to Netherlands.
Lubricants do	111,860	[2]96,622	184	Paraguay 14,879; Guyana 13,292; Suriname 11,347.
Residual fuel oil do	1,164	--		
Bitumen and other residues do	17,629	7	--	All to Barbados.

[r] Revised. NA Not available.

[1] Table prepared by John G. Panulas.

[2] Excludes unreported quantity valued at $12,825.

Table 3.—Jamaica: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	47	13,279	4,447	West Germany 8,750; United Kingdom 82.
Metal including alloys:				
Unwrought	1,269	1,570	1	Canada 1,517; United Kingdom 52.
Semimanufactures	2,205	2,096	717	United Kingdom 668; Canada 505; Switzerland 96.
Copper:				
Sulfate	14	8	8	
Metal including alloys:				
Unwrought	(2)	18	18	
Semimanufactures	7,312	2,148	89	United Kingdom 750; Hong Kong 267; Spain 20.
Gold:				
Waste and sweepings value	$992	$4,169	$4,169	
Metal including alloys, unwrought and partly wrought troy ounces	323,210	2,829	--	Canada 2,411; West Germany 225; United Kingdom 129.
Iron and steel: Metal:				
Scrap value	--	$21,734	$5,036	United Kingdom $16,698.
Pig iron, cast iron, related materials	(3)	23	23	
Ferroalloys	86	(4)	NA	NA.
Steel, primary forms	8,062	7,435	5,893	North Korea 758; United Kingdom 429; Trinidad and Tobago 351.
Semimanufactures:				
Bars, rods, angles, shapes, sections	10,369	15,122	8,902	Trinidad and Tobago 1,532; Belgium-Luxembourg 841; North Korea 383.
Universals, plates, sheets thousand tons	15	35	35	United Kingdom.[2]
Hoop and strip	285	600	116	United Kingdom 290; Belgium-Luxembourg 175.
Rails and accessories	1	426	287	Italy 100; France 39.
Wire	39,337	3,775	134	Belgium-Luxembourg 1,499; United Kingdom 643; Barbados 382.
Tubes, pipes, fittings	3,529	3,025	2,178	Japan 383; Canada 163; United Kingdom 160.
Lead:				
Oxides thousand tons	NA	403	121	Mauritius 137; Mexico 133; Netherlands 10.
Metal including alloys:				
Unwrought	41	55	--	All from United Kingdom.
Semimanufactures	76	75	30	Canada 32; United Kingdom 13.
Manganese: Ore and concentrate	353	167	--	United Kingdom 113; Spain 54.
Molybdenum: Metal including alloys, unwrought kilograms	1	(2)	NA	NA.
Nickel: Metal including alloys, semimanufactures	5,005	15,356	1,146	United Kingdom 14,209; Canada 1.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	9,259	1,447	--	All from United Kingdom.
Silver: Metal including alloys, unwrought and partly wrought troy ounces	41,828	17,779	1,382	United Kingdom 8,841; West Germany 7,555.
Tin: Metal including alloys:				
Unwrought	(2)	2	--	All from Denmark.
Semimanufactures	13,138	8,752	1,356	United Kingdom 4,732; Japan 895; Netherlands 123.
Titanium: Oxides	772	660	229	United Kingdom 430.
Zinc:				
Oxides	306	174	92	Venezuela 49; United Kingdom 30.
Blue powder	31	6	--	All from United Kingdom.
Metal including alloys:				
Unwrought	373	935	--	Canada 934; United Kingdom 1.
Semimanufactures	1	NA		
Other:				
Ores and concentrates	NA	4	--	All from United Kingdom.
Oxides and hydroxides	^{r}109	290	219	Japan 31; Finland 22; United Kingdom 14.

See footnotes at end of table.

Table 3.—Jamaica: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	17	16	10	United Kingdom 6.
Dust and powder of precious and semiprecious stones excluding diamond value, thousands	$5	$2	--	All from United Kingdom.
Grinding and polishing wheels and stones	1	5	1	Italy 3.
Asbestos, crude	78	491	122	Canada 238; Botswana 99; Brazil 29.
Diamond: Industrial value	$8,348	$1,417	--	United Kingdom $1,007; Italy $410.
Diatomite and other infusorial earth	262	58	58	
Feldspar, fluorspar, related materials	6	13	13	
Fertilizer materials: Manufactured:				
Ammonia	242	247	67	United Kingdom 170; Canada 9.
Nitrogenous	31,996	11,406	402	Trinidad and Tobago 6,678; Netherlands Antilles 4,198.
Phosphatic	13,245	84,329	74,981	Netherlands 9,346; West Germany 2.
Potassic	13,687	8,477	2,977	Canada 5,100; Dominican Republic 400.
Mica:				
Crude including splittings and waste	73	77	3	Norway 74.
Worked including agglomerated splittings kilograms	320	974	973	United Kingdom 1.
Nitrates, crude	2	--		
Pigments, mineral:				
Natural, crude value	$1,181	$1,859	$35	United Kingdom $1,824.
Iron oxides and hydroxides, processed	19	97	9	United Kingdom 37; West Germany 22; Belgium-Luxembourg 17.
Precious and semiprecious stones other than diamond value	$59,298	$37,619	$551	Israel $36,263; France $805.
Salt and brine	41,269	45,440	44,912	Canada 280; Trinidad and Tobago 248.
Sodium compounds, n.e.s.: Carbonate, manufactured	4,960	3,555	3,525	Netherlands 19; United Kingdom 10.
Sulfur:				
Elemental:				
Crude including native and byproduct	8,542	24	24	
Colloidal, precipitated, sublimed	108	301	300	United Kingdom.[3]
Dioxide	8	3,001	3,000	United Kingdom 1.
Sulfuric acid	2,164	3,928	3,714	Norway 213.
Talc, steatite, soapstone, pyrophyllite	286	287	204	Norway 74; Canada 9.
Other: Crude	500	1	1	
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	41	51	49	United Kingdom 2.
Carbon: Carbon black	837	832	1	Venezuela 819; Canada 11.
Coke and semicoke	651	215	103	West Germany 101; United Kingdom 11.
Peat including briquets and litter value, thousands	NA	$7	--	All from Austria.
Petroleum:				
Crude thousand 42-gallon barrels	5,489	320	--	All from Netherlands Antilles.
Refinery products:				
Liquefied petroleum gas do	434	171	9	Venezuela 160.
Gasoline:				
Aviation do	18	18	([2])	Mainly from Netherlands Antilles.
Motor do	321	386	23	Netherlands Antilles 363.
Mineral jelly and wax do	20	16	2	Japan 8; United Kingdom 4.
Kerosine and jet fuel do	213	381	39	Netherlands Antilles 342.
Distillate fuel oil do	121	369	6	Netherlands Antilles 363.
Lubricants do	48	41	2	Netherlands Antilles 18; Trinidad and Tobago 9.
Residual fuel oil do	9	7	--	Netherlands Antilles 6; Trinidad and Tobago 1.
Bitumen and other residues do	2	24	24	

[r] Revised. NA Not available.

[1] Table prepared by John G. Panulas.

[2] Less than 1/2 unit.

[3] Unreported quantity valued at $14,927.

[4] Unreported quantity valued at $553.

TRINIDAD AND TOBAGO

Petroleum production continued to dominate the mineral industries of Trinidad and Tobago and represented the major source of Government revenue and export earnings. However, further declines in refined and crude oil production and prices placed additional strains on the Government's financial resources and necessitated increased external borrowing and the imposition of controlling economic measures. Expected gains from the relatively new industrial complex of the Iron and Steel Co. of Trinidad and Tobago (ISCOTT) were not forthcoming because of weak world demand and prices. The fertilizer and other petrochemical industries have exhibited considerable growth, and new plants are under consideration. In 1983, Trinidad and Tobago was expected to rank second only to the Soviet Union in world export of ammonia.

The iron and steel, fertilizer, and petrochemical industries at Point Lisas represent a deliberate attempt by the Government to establish energy-based and export-oriented projects that use natural gas as feedstock and/or fuel.

The Government expressed confidence that the trade advantages offered by the CBI will bring new investors into Trinidad and Tobago, expand the industrial base, and provide the future export diversification necessary to establish a well-balanced economy not overly dependent on one sector. The CBI also held promise to benefit existing industries that have had difficulty competing in the international export markets. Petroleum products are excluded from duty-free CBI treatment.

The ISCOTT iron and steel complex has been unable to fulfill its production capability because of several unfortunate circumstances. Prominent among these has been that ISCOTT's inauguration came at a time of increasing world economic recession when the need for raw material feedstock and semimanufactured steel products was declining. The weak market condition has persisted and caused considerable problems and rivalry among the world's iron and steel producers. ISCOTT attributed low sales as partly due to increased protectionist attitudes in the United States and other countries as local producers agitated against a rising share of low-cost imports in declining domestic markets. Managerial and technical problems were also cited as contributing to ISCOTT's poor performance.

In October 1982, five U.S. steel companies (Atlantic Steel Co. of Georgia, Continental Steel Corp. of Indiana, Georgetown Steel Corp. of South Carolina, Georgetown Texas Steel Corp., and Raritan River Steel Co. of New Jersey) filed an antidumping petition against ISCOTT with the U.S. Department of Commerce and the International Trade Commission. The petition charged that ISCOTT steel rods were being sold in the United States at lesser prices than they sold for on the Trinidad and Tobago market. A preliminary ruling was made in May 1983 by Commerce that ISCOTT has a 14.2% dumping margin. Two weeks after this ruling, the same U.S. companies filed a countervailing duty petition (CVD) against ISCOTT, alleging that Government subsidies to the company in 1982 amounted to $200 million. The petitioners sought countervailing duties of 402% on ISCOTT's wire rod sales in the United States. This was to be in addition to any other duty imposed. In 1982, ISCOTT shipments of wire rod to the United States totaled 56,340 tons, which the petitioners claimed made it one of the larger foreign suppliers of wire rod. The petitioners claimed that ISCOTT's exports were subsidized by a variety of schemes, such as loans at preferential terms, subsidized fuel rates, and import duty relief on machinery and equipment purchases.

In the first petition, there was a ruling for a 14.2% dumping margin on ISCOTT's wire rod. In the CVD petition, imports of steel wire rod from ISCOTT were found to be subsidized by 6.74%. The total duty to be levied against imports of ISCOTT wire rod was about 21%. This was considered a separate issue from any tariff relief afforded to Trinidad and Tobago by the late 1983 passage of the CBI.

Passage of the CBI opened up serious questions involving a potential for downstream dumping and other steel trade issues. Although some products were exempted from the CBI tax and trade incentives, steel was not. This presented possibilities whereby steel products from outside the CBI sphere could be shipped to one of these countries, fabricated (to comply with the requirement that 35% of value be added in the Basin), and then shipped to U.S. markets duty free. This situation caused the U.S. iron and steel companies to protest.

Decreased crude oil production in 1983 reflected the natural decline of producing wells and a low level of new discoveries. The fiscal impact was a $300 million[11] drop in the Government's 1982 petroleum-derived revenue. A $400 million revenue decrease was expected for 1983. The daily average production, by company, is shown in the following table:

Company	Average barrels per day			1983 (percent of production)
	1981	1982	1983	
Amoco Trinidad Oil Co. Ltd	103,443	92,942	81,733	51.2
Trinidad Northern Areas Ltd	37,387	37,968	36,891	23.1
Trinidad-Tesoro Oil Co	24,299	22,680	21,405	13.4
Texaco Trinidad Inc	16,380	15,447	11,211	7.0
Trinidad and Tobago Oil Co	7,564	7,688	8,009	5.0
Premier Consolidated Oilfields Ltd	261	313	327	.2
Total	189,334	177,038	159,576	100.0

Source: The Wall Street Journal. Feb. 10, 1984, p. 10.

As an incentive to increase oil exploration, the Government reduced the Supplemental Petroleum Tax (SPT), a levy on gross revenues, from 35% onshore to 15% onshore, retroactive to January 1, 1983. New incentives were also provided for utilizing enhanced recovery techniques and for initiating well workovers. A reduction of the 65% SPT on marine production was under study.

Texaco Trinidad Inc. (Textrin), which was coincidentally trying to divest itself of the refinery operation, announced a $20 million investment to restart a suspended drilling and steam injection project. State-owned Trinidad and Tobago Oil Co. (Trintoc) announced it would start an $11 million drilling program.

Premier Consolidated Oilfields Ltd., the smallest crude oil producer, announced a steam injection program to boost production from the Fyzabad Field. Premier drilled two shallow wells into the upper Cruse Formation in the San Francique region of southern Trinidad. One well produced 30 barrels of oil per day at horizons between 60 and 200 feet, and the other well produced from sands at the 200-foot level. The company planned to drill three additional wells, estimated to cost about $21,000 for each completion. Eventually, 20 wells were expected to be drilled in this upthrown block area. A similar structure to the west had produced a total of 400,000 barrels of oil from 10 wells, and Premier expected the new area to contain 800,000 barrels of recoverable reserves.

Amoco Trinidad Oil Co. Ltd., the largest crude oil producer, also produced 80% of the natural gas production. The two new nonassociated gas wells brought in off Galeota Point in 1982 each produced at the rate of 50 million cubic feet per day, reportedly one of the highest rates in the Western Hemisphere. Offshore reserves of natural gas were placed at 18 trillion cubic feet.

Trinidad and Tobago negotiated a $50 million loan from a consortium of banks headed by Orion Royal Bank to construct 40 miles of natural gas pipeline from the offshore Amoco gasfields west to the Point Lisas industrial park. The $140 million project, with a capacity of 1 billion cubic feet per day, was to supply fuel and feedstock to existing and planned industrial plants at Point Lisas.

Recoverable crude oil reserves were placed at 580 million barrels, sufficient for about 10 years of production at the 1983 level. The Government believed that at least 1 billion barrels of heavy oil reserves is also recoverable.

The contracting export market for petroleum products reduced sales by the 350,000-barrel-per-day refinery owned by Textrin. Capacity was downgraded to 220,000 barrels per day. About 45% of the refinery's output was fuel oil, and the principal export market was traditionally the United States. The refinery's product is no longer competitive in the U.S. market. The refinery also lost its major processing agreement customer for reexport to the United States.

The Textrin refinery operated at about 23% of rated capacity, and only reached that level because state-owned Trintoc agreed to supply 37,000 barrels of crude oil per day from its own production. For the first time in decades, no crude oil was imported for local refining. The cost of adjusting the product mix to produce a greater proportion of middle distillates required a higher expenditure than Textrin wanted to make. Negotiations were underway between the Government and Textrin for the sale of the refinery. Textrin indicated it might be willing to retain a 25% minority interest.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Bahamian dollars (B$) to U.S. dollars at the rate of B$1.00 = US$1.00.

[3] Where necessary, values have been converted from Barbadian dollars (Bds$) to U.S. dollars at the rate of Bds$2.00 = US$1.00.

[4] Where necessary, values have been converted from Cuban pesos (CP$) to U.S. dollars at the rate of CP$1.20 = US$1.00.

[5] The Latin American Times. No. 57, Feb. 28, 1984, pp. 18-20.

[6] Cuba reports crude oil production in metric tons. When converting this measurement to barrels, it appears that the same conversion factor has not been used by the various analysts. For the purpose of this report, a factor of 6.652 has been used until more reliable information becomes available.

[7] Oil and Gas Journal. Feb. 13, 1984, pp. 50-51.

[8] Where necessary, values have been converted from Dominican Republic pesos (RD$) to U.S. dollars at the rate of RD$1.00 = US$1.00.

[9] Secretaria de Estado de Industria y Comercio, Dirección General de Mineriá. Dominican Republic, Guidelines for Investment in Mining. 1983, 46 pp.; available upon request from Office of the Dirección General de Mineriá, Edificio de Oficinas Gubernamentales, Avenida México, Santo Domingo, República Dominicana.

[10] Where necessary, values have been converted from Jamaican dollars (J$) to U.S. dollars at the official rate of J$1.78 = US$1.00.

[11] Where necessary, values have been converted from Trinidad and Tobago dollars (TT$) to U.S. dollars at the rate of TT$2.40 = US$1.00.

Table 4.—Trinidad and Tobago: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	NA	4	NA	NA.
Copper: Metal including alloys, all forms	69	59	--	Mainly to United Kingdom.
Iron and steel: Metal:				
Scrap	56	173	33	NA.
Pig iron, sponge iron, related materials	^{r}87,100	--		
Steel, primary forms	NA	10,045	NA	NA.
Semimanufactures:				
Bars, rods, angles, shapes, sections	5,400	61,319	NA	St. Lucia 4.
Tubes, pipes, fittings	NA	44	NA	NA.
Lead:				
Oxides	^{r}14	--		
Metal including alloys, all forms	NA	10	NA	NA.
Tin: Metal including alloys, all forms	(2)	--		
Zinc: Metal including alloys, all forms	(2)	2	--	United Kingdom 1.
Other: Oxides and hydroxides kilograms	NA	200	NA	NA.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones kilograms	(2)	--		
Asbestos, crude value	^{r}$220	--		
Barite and witherite	^{r}1	--		
Cement	^{r}16	45	--	Guyana 1.
Chalk value	(2)	--		
Clays, crude	^{r}1	--		
Diamond: Gem, not set or strung value, thousands	(2)	--		
Fertilizer materials: Manufactured:				
Ammonia	(2)	NA		
Potassic	(2)	--		
Gypsum and plaster	(2)	--		
Lime	(2)	(3)	NA	NA.
Mica:				
Crude including splittings and waste	(2)	--		
Worked including agglomerated splittings	(2)	--		
Salt and brine	^{r}317	212	NA	NA.
Sodium compounds, n.e.s.: Carbonate, natural and manufactured	^{r}5	302	--	Grenada 250.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	42	(4)	NA	NA.
Worked	(2)	--		
Gravel and crushed rock	^{r}6	44	NA	NA.

See footnotes at end of table.

Table 4.—Trinidad and Tobago: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982: United States	Destinations, 1982: Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Quartz and quartzite value	$4,000	--		
Sand other than metal-bearing	NA	52	NA	NA.
Sulfur:				
Elemental: Colloidal, precipitated, sublimed	(2)	--		
Sulfuric acid	(2)	(5)	NA	NA.
Talc, steatite, soapstone, pyrophyllite	(2)	--		
Other: Crude	(2)	NA		
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	NA	12,468	262	United Kingdom 5,337.
Coal: All grades including briquets	33,662	[6]127	NA	NA.
Petroleum:				
Crude thousand 42-gallon barrels	(2)	905	813	Italy 92.
Refinery products:				
Liquefied petroleum gas 42-gallon barrels	[r]1,056	404	--	Panama 74; Barbados 62; Guyana 52.
Mineral jelly and wax thousand 42-gallon barrels	[r]72	275	NA	NA.
Kerosine and jet fuel do.	NA	1,540	311	Barbados 749; Antigua 352; Suriname 128.
Distillate fuel oil do.	NA	2,134	121	Honduras 281; Suriname 230.
Lubricants do.	NA	35	NA	NA.
Nonlubricating oils do.	NA	(5)	NA	NA.
Residual fuel oil do.	25	5,091	1,381	Netherlands 1,002; Suriname 346.
Asphalt do.	267	76	2	United Kingdom 32.
Bituminous mixtures do.	10,102	11,575	133	United Kingdom 424; Barbados 321.

[r]Revised. NA Not available.

[1]Table prepared by John G. Panulas.

[2]Revised to zero.

[3]Undisclosed quantity valued at $48.

[4]Undisclosed quantity valued at $340.

[5]Less than 1/2 unit.

[6]Excludes unreported quantity valued at $2,524.

Table 5.—Trinidad and Tobago: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982: United States	Sources, 1982: Other (principal)
METALS				
Aluminum:				
Ore and concentrate	182	286	NA	NA.
Oxides and hydroxides	72	4	3	United Kingdom 1.
Metal including alloys, all forms	8,519	6,862	4,345	United Kingdom 220.
Chromium: Oxides and hydroxides	NA	15	(2)	United Kingdom 4.
Copper:				
Sulfate	NA	13	(2)	United Kingdom 12.
Metal including alloys, all forms	617	1,271	362	United Kingdom 789.
Iron and steel:				
Iron ore and concentrate, excluding roasted pyrite	198,997	257,883	--	Mainly from Brazil.
Metal:				
Scrap	56	8	8	
Pig iron, cast iron, related materials	15	10	--	All from United Kingdom.
Ferroalloys:				
Ferromanganese	NA	2,615	2,615	
Ferrosilicon	NA	2,380	NA	NA.
Unspecified	NA	320,001	--	United Kingdom 316,030.
Steel, primary forms	10,404	14,449	191	Japan 1,551; United Kingdom 418.
Semimanufactures:				
Bars, rods, angles, shapes, sections	60,192	238,434	358	United Kingdom 226,644; Belgium-Luxembourg 2,110.

See footnotes at end of table.

Table 5.—Trinidad and Tobago: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Semimanufactures —Continued				
Universals, plates, sheets	19,301	42	--	United Kingdom 14.
Hoop and strip	978	347	75	United Kingdom 69; Japan 19.
Rails and accessories	(3)	5	--	United Kingdom 4.
Wire	14,178	10,051	603	United Kingdom 5,981; Japan 233; West Germany 78.
Tubes, pipes, fittings thousand tons	14	1,618	698	Japan 745.
Castings and forgings, rough	3	709	569	NA.
Lead:				
Oxides	417	594	--	United Kingdom 579; Spain 3.
Metal including alloys, all forms	(4)	16,107	117	United Kingdom 492.
Magnesium: Metal including alloys, all forms	9	2,763	35	United Kingdom 640.
Manganese: Ore and concentrate	NA	200	NA	NA.
Nickel: Metal including alloys, all forms	1	13,926	--	Japan 140; United Kingdom 111.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	NA	1,672	--	United Kingdom 1,222.
Silver: Metal including alloys, unwrought and partly wrought do.	(5)	59,093	--	Canada 31,733; United Kingdom 13,760.
Tin: Metal including alloys, all forms	504	3,170	10	United Kingdom 3,005; Netherlands 102.
Titanium: Oxides	938	844	190	United Kingdom 407; West Germany 43.
Tungsten: Metal including alloys, all forms kilograms	8	1,335	241	NA.
Zinc:				
Oxides	153	173	1	United Kingdom 102.
Metal including alloys, all forms	548	187	34	Canada 95; United Kingdom 1.
Other:				
Ores and concentrates value	$108,000	NA		
Oxides and hydroxides	NA	205	116	United Kingdom 24; West Germany 18; Netherlands 3.
Ashes and residues	NA	1	1	
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	6	146	126	NA.
Grinding and polishing wheels and stones	110	NA		
Asbestos, crude	2	8	3	NA.
Barite and witherite	82,882	22,543	--	Peru 7,006; Brazil 3,650; West Germany 59.
Boron materials: Crude natural borates	--	3	NA	NA.
Cement	^{r}293,726	422,702	40,396	Colombia 322,576; United Kingdom 36,825.
Chalk	18,324	844	74	United Kingdom 448.
Clays, crude	110,236	6,124	950	NA.
Diamond:				
Gem, not set or strung carats	(6)	2,392	109	Belgium-Luxembourg 986; United Kingdom 326.
Industrial do.	(7)	5,000	5,000	
Diatomite and other infusorial earth	--	577	--	United Kingdom 533.
Feldspar, fluorspar, related materials	2,493	84	--	United Kingdom 50.
Fertilizer materials:				
Crude, n.e.s	7,811	350	350	
Manufactured:				
Nitrogenous	5,095	571	33	West Germany 261; United Kingdom 1.
Phosphatic	962	1,080	965	NA.
Potassic	106,511	1,540	8	NA.
Unspecified and mixed	8,491	NA		
Graphite, natural value	$6,000	$32,703	--	United Kingdom $597.
Gypsum and plaster	8,487	16,185	NA	Venezuela 4,904; United Kingdom 59; Barbados 5.
Lime	141,795	96,438	307	United Kingdom 95,605; Jamaica 314; Barbados 76.
Magnesite	1	8	NA	NA.
Mica:				
Crude including splittings and waste	176	184	--	United Kingdom 99.
Worked including agglomerated splittings	15	NA		
Phosphates, crude	NA	350	350	

See footnotes at end of table.

Table 5.—Trinidad and Tobago: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Pigments, mineral: Iron oxides and hydroxides, processed	87	131	--	West Germany 31.
Precious and semiprecious stones other than diamond: Natural carats	NA	1,714	--	West Germany 14.
Salt and brine	34,817	18,996	--	Jamaica 1,772; United Kingdom 208.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	5,194	4,908	4,689	United Kingdom 179.
Sulfate, manufactured	4,033	3,135	5	Belgium-Luxembourg 3,010; Netherlands 96; United Kingdom 4.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked value	$67,000	$42,230	NA	NA.
Worked	11	274	--	Italy 10; Barbados 7; Canada 4.
Dolomite, chiefly refractory-grade value	$316	$70,765	NA	NA.
Gravel and crushed rock	16,131	18,618	664	Italy 306; Venezuela 6.
Limestone other than dimension	14,110	78,788	NA	Barbados 55,010; United Kingdom 1.
Quartz and quartzite	NA	16	NA	NA.
Sand other than metal-bearing	608	569	NA	NA.
Sulfur:				
Elemental: Colloidal, precipitated, sublimed	5	52	NA	NA.
Dioxide	NA	67	--	United Kingdom 1.
Sulfuric acid	534	435	9	United Kingdom 405.
Talc, steatite, soapstone, pyrophyllite	1,785	691	529	United Kingdom 2.
Other: Crude	4,410	213	210	United Kingdom 3.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	NA	2	2	
Carbon: Carbon black	r307	--		
Coal:				
Anthracite	NA	1,413	1,400	NA.
Bituminous	NA	41	--	Mainly from United Kingdom.
Briquets of anthracite and bituminous coal	NA	17	--	United Kingdom 7.
Lignite including briquets	NA	153	NA	NA.
Peat including briquets and litter	28	174	--	Mainly from United Kingdom.
Petroleum:				
Crude thousand 42-gallon barrels	42,857	26,498	--	Saudi Arabia 12,713; Indonesia 9,759; Ecuador 1,926.
Refinery products:				
Liquefied petroleum gas 42-gallon barrels	r15,857	50,147	--	Antigua 15.
Gasoline do.	31,289	--		
Mineral jelly and wax do.	3,452	3,290	496	United Kingdom 1,251; West Germany 724; Netherlands 56.
Lubricants do.	NA	3,374	910	United Kingdom 2,058; France 266.
Nonlubricating oils do.	NA	56,014	--	United Kingdom 3.
Residual fuel oil do.	167	NA		
Bituminous mixtures do.	NA	43,911	39,438	United Kingdom 3,885.
Petroleum coke do.	NA	1,892	NA	NA.

rRevised. NA Not available.

[1] Table prepared by John G. Panulas.

[2] Less than 1/2 unit.

[3] Undisclosed quantity valued at $54,000.

[4] Undisclosed quantity valued at $716,000.

[5] Undisclosed quantity valued at $254,000.

[6] Undisclosed quantity valued at $864,000.

[7] Undisclosed quantity valued at $1,000.

The Mineral Industry of Central American Countries

By Doris M. Hyde and Orlando Martino

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Mineral output and trade in the Central American countries were directly or indirectly affected by the sometimes violent civil unrest and recessionary economic developments that have pervaded the region for several years. Central American countries found their foreign exchange export earnings and traditional market areas shrinking while essential import costs were rising. Restricted spending measures were adopted by governments and private industries. Domestic investment funds for mineral development and exploration projects were among the first casualties of these austere budgetary measures, especially since weak demand and depressed mineral prices diminished the probability of a favorable cost-benefit ratio. The lack of physical security and political stability also discouraged private foreign investment.

The United States Congress enacted the Caribbean Basin Economic Recovery Act of 1983 (19 U.S.C. 2702), more popularly known as the Caribbean Basin Initiative (CBI). This legislation was designed to stimulate economic recovery and promote economic development by increasing private investment and trade in the Caribbean Basin countries. The act provided for the elimination of U.S. duties on most trade items imported directly from eligible Caribbean countries, provided at least 35% of the product value originated in the region. The financial assistance components of the CBI were to be supportive of the basin's private sector as well as assist general economic stabilization programs.

The CBI provides qualified countries with duty-free trade access to U.S. markets for a period of 12 years. Petroleum and petroleum products were among those items excluded from duty-free treatment, but other minerals and mineral-related products were included. The trade provisions of the CBI were to become effective January 1, 1984, but increased economic assistance funds were made available in 1982 and 1983 through various existing aid programs.

One of the productive areas for possible assistance through the CBI or other complementary aid programs is the minerals sector. Development in this sector would provide raw materials for import substitution as well as stimulate export and domestic markets by providing feedstock for established or new industries producing finished or semifinished products. An additional benefit of mineral exploitation would be the creation of new or improved infrastructure in areas that are often remote and under-developed.

There has been a general acknowledgment that any programs devised to improve the economic foundations of the countries in Central America must necessarily include the development of all available natural resources, including minerals, energy, and water. In recognition of this basic need, and in anticipation of the development assistance funding and technical expertise required to design and successfully complete resource-oriented long-term projects, the U.S. Geological Survey prepared a report on Central America that summarized information on known and potential earth resources.[1] The report also lists concerned local government agencies and the history of some natural resource development programs in Central America.

BELIZE[2]

Traditionally dominated by an agrarian economy, Belize's history of mineral exploitation is limited to the quarrying of construction materials. Most of the country is composed of flat-lying, unaltered sedimentary rocks. In the central part of Belize, the deeply dissected Maya Mountains reach heights of over 3,000 feet and represent an uplifted fault block. The mountains are composed of variably metamorphosed Paleozoic rocks intruded by igneous stocks and volcanics.

Any possibility for base metal discoveries would probably lie within the Maya Mountains where gold, tin, copper, lead, zinc, and barite occurrences have been recognized by various prospectors. Minimal information is available on past exploration activities and there has been no publicized recent commercially funded reconnaissance in the region.

The possibility of finding petroleum resources has brought foreign exploration companies into Belize. The area proved attractive because of stratigraphic extensions into Belize of sedimentary formations or geologic provinces that have been proven to contain crude oil reserves in Guatemala to the west and Mexico to the north.

In 1982, the Government established a special petroleum office within the Ministry of Natural Resources in order to promote petroleum exploration. The requirements for obtaining licenses and concession contracts have been tightened by the stipulation that companies must furnish information demonstrating their financial capability to carry out the contracted exploration program. This was expected to eliminate small companies that obtain concessions on a more speculative basis rather than with serious exploration intent. Exploration drilling was expected to increase in 1984, with most activity around the onshore coastal concessions.

In 1981, oil shows were found in a well drilled in the Orange Walk District by Placid Oil Co. In 1983, Bogert Oil Co. of Oklahoma City, Oklahoma, drilled one shallow wildcat in a 255,000-acre concession north of Belmopan. A second drilling attempt was reported to have been made into a 1970 abandoned well. These wells were reported as testing some crude oil but not in commercial quantities. Bogert Oil, a 22% partner in the venture with Hughes Drilling Co., planned to continue exploration activity.

Table 1.—Central American Countries: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Country and commodity	1979	1980	1981	1982^{p}	1983^{e}
BELIZE					
Stone, sand and gravel:					
Limestone	364,160	336,900	479,640	356,130	[2]608,860
Marl	2,462,100	2,064,300	617,460	503,930	--
Sand and gravel	715,100	625,000	589,290	521,030	[2]554,370
COSTA RICA					
Cement	527,893	553,699	694,000	750,200	750,000
Clays: Kaolin	450	500	450	522	500
Diatomite	590	600	550	470	450
Gold^{e} troy ounces	^{r}16,700	^{r}18,000	^{r}20,000	27,000	30,000

See footnotes at end of table.

Table 1.—Central American Countries: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country and commodity	1979	1980	1981	1982[p]	1983[e]
COSTA RICA —Continued					
Lime[e]	9,000	7,500	7,000	9,000	9,000
Petroleum refinery products thousand 42-gallon barrels	6,350	3,781	[e]3,750	3,700	[2]2,298
Pumice	1,260	[e]1,200	[r] [e]1,300	1,500	1,500
Salt, marine	46,000	[e]40,000	[e]39,000	110,200	110,000
Silver[e] troy ounces	2,000	1,600	1,500	2,000	2,000
Stone, sand and gravel:					
Crushed rock and rough stone cubic meters	602,000	[e]600,000	[e]550,000	534,600	525,000
Limestone and other calcareous materials	[e]53,000	[e]55,000	[e]70,000	109,100	110,000
Sand and gravel cubic meters	260,000	[e]250,000	[e]250,000	276,700	280,000
EL SALVADOR					
Aluminum metal including alloys, semimanufactures	2,313	1,587	1,175	1,143	1,344
Cement	[r]591,188	519,892	457,897	417,796	431,552
Gold troy ounces	2,720	2,492	3,883	3,300	650
Gypsum[e]	7,000	9,000	6,000	[r]5,000	4,500
Iron and steel: Metal:					
Steel, crude	[e]14,000	[e]14,000	[e]10,000	7,265	10,900
Semimanufactures	27,198	30,959	25,420	16,016	21,002
Limestone	900,000	850,000	810,000	800,000	850,000
Petroleum refinery products thousand 42-gallon barrels	5,229	4,572	4,432	4,002	4,000
Salt[e]	27,000	27,000	25,000	25,000	20,000
Silver, fine troy ounces	151,582	146,202	137,005	85,713	21,988
GUATEMALA					
Antimony, mine output, metal content	660	556	511	[e]500	--
Barite	3,600	4,610	5,200	2,000	300
Cement	573,643	568,875	568,012	[e]540,000	530,000
Clays:					
Bentonite	[e]2,700	2,600	[e]2,500	2,500	8,000
Other	131,036	169,861	165,641	160,000	137,672
Copper, Cu content of concentrates	1,768	842	726	[e]700	700
Feldspar	10,601	21,530	10,044	[e]12,000	10,000
Gas, natural, gross million cubic feet	200	584	515	1,097	1,220
Gypsum, crude:					
For cement manufacture	18,323	19,310	18,588	[e]17,000	16,588
Other	7,086	13,939	10,134	[e]11,000	22,000
Iron and steel:					
Iron ore, gross weight	2,895	3,500	4,025	4,000	860
Steel, crude	NA	NA	NA	25,000	28,000
Semimanufactures	NA	NA	NA	27,000	30,000
Lead:					
Mine output, metal content	[e]100	[e]100	--	--	--
Metal including secondary	90	92	41	40	60
Lime	40,575	35,580	24,655	[e]24,500	24,500
Nickel, mine output, metal content[3]	6,199	6,940	--	--	--
Petroleum:					
Crude thousand 42-gallon barrels	571	1,513	1,494	2,292	2,549
Refinery products do	5,767	5,381	5,345	4,508	4,720
Pumice and related materials:					
Pumice	18,000	18,000	[e]15,000	[e]12,000	12,000
Volcanic ash	36,581	12,721	5,451	[e]4,000	4,000
Salt	14,493	9,526	13,679	[e]14,000	14,000
Silver, mine output, metal content[e] troy ounces	10,000	10,000	8,000	8,000	8,000
Stone, sand and gravel:					
Limestone thousand tons	815	920	920	950	1,215
Marble cubic meters	441	1,353	1,226	1,200	1,000
Silica sand	40,320	69,553	35,582	35,000	18,400
Sand and gravel cubic meters	788,494	604,323	269,844	250,000	525,000
Tungsten, mine output, W content of concentrate	--	50	42	40	--
Zinc, mine output, metal content	[r] [e]300	(4)	2,996	[e]1,000	--
HONDURAS					
Antimony, mine output, metal content	46	23	[e]20	--	--
Cadmium, mine output, metal content	204	229	176	200	[2]161
Cement	231,000	445,000	311,000	277,440	[2]485,435
Copper, Cu content of lead and zinc concentrates	1,390	269	454	450	650
Gold troy ounces	1,501	2,027	1,579	1,711	[2]2,151
Gypsum	[e]22,600	22,600	20,000	20,000	22,000
Iron and steel: Metal, semimanufactures	[e]24,000	24,500	20,000	20,000	20,000
Lead, mine output, metal content	[r]16,416	[r]13,315	12,592	15,120	19,290

See footnotes at end of table.

Table 1.—Central American Countries: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country and commodity	1979	1980	1981	1982[p]	1983[e]
HONDURAS —Continued					
Petroleum refinery products thousand 42-gallon barrels	3,485	3,648	1,901	685	[2]3,983
Salt[e]	32,600	32,600	30,000	30,000	30,000
Silver thousand troy ounces	2,434	1,766	1,823	2,100	[2]2,584
Stone:[e]					
Limestone	500,000	500,000	450,000	500,000	500,000
Marble	43,000	43,000	40,000	40,000	40,000
Zinc, mine output, metal content	[r]19,845	[r]16,026	16,190	24,554	[2]37,980
NICARAGUA					
Cement	86,158	153,926	[e]100,000	[e]100,000	100,000
Gold, mine output, metal content troy ounces	61,086	[r]59,994	[e]62,000	51,849	[2]46,742
Gypsum and anhydrite, crude[e]	36,000	40,000	30,000	20,290	20,000
Lime[e]	36,000	40,000	30,000	30,000	30,000
Petroleum refinery products thousand 42-gallon barrels	3,364	4,087	3,925	4,244	[2]3,914
Salt, marine[e]	18,000	20,000	18,000	18,000	18,000
Sand and gravel cubic meters	[e]80,000	NA	NA	502,812	500,000
Silver, mine output troy ounces	390,406	[2]164,060	[e]150,000	75,551	[2]63,547
PANAMA					
Cement	510,000	565,000	520,000	349,991	[2]326,170
Clays and clay products:					
Crude	206,892	183,182	99,071	84,261	[2]58,284
Products cubic meters	31,497	40,603	52,010	60,606	[2]18,255
Petroleum refinery products thousand 42-gallon barrels	17,155	[r]13,642	10,524	11,845	[2]11,755
Salt, marine	17,087	18,583	[5]32,100	24,300	[2]85,491
Stone, sand and gravel:					
Limestone[6]	478,322	536,250	393,722	439,952	[2]448,145
Other thousand cubic meters	640	731	842	894	[2]802

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Includes data available through Aug. 17, 1984.

[2] Reported figure.

[3] Ni content of sinter.

[4] Revised to zero.

[5] Data prior to 1981 refer to refined salt. Figures for 1981 and later years reflect crude salt production.

[6] Excludes approximately 8,000 cubic meters per year, apparently dimension stone.

COSTA RICA[2]

The minerals sector continued to have little impact on the Costa Rican economy. Gold is the principal mineral produced, along with a small amount of silver. Various industrial minerals and construction materials are also mined or quarried. Within the next few years, copper may be added to the exploited mineral category. Other metallic mineral deposits have been reported including lead, zinc, aluminum, manganese, and iron- and titanium-bearing sands. Estimations of the economic potential of these known deposits, and others as yet undetected, must await extensive mapping, geochemical, and geophysical programs. These costly and time-consuming operations preclude anything but speculation as to the future prospects for Costa Rica's mineral industries.

The Government reversed a 2-year trend of negative economic indicators and ended 1983 with an estimated $3 billion[3] gross domestic product (GDP). In real terms, this implied a growth rate of just under 1%. This positive control of the economy was considered to be somewhat tenuous because all sectors except agriculture and electricity registered declines, although not as sharp as those experienced in 1982. The Government initiated austere economic measures and successfully complied with the terms of an International Monetary Fund standby agreement. Payments on the external public debt were also rescheduled. The average rate of inflation on the consumer price index dropped sharply from over 80% in 1982 to under 11% in 1983, although the rate for some individual sectors was somewhat higher.

The CBI was expected to spur economic revitalization in Costa Rica because of the Government's traditional positive attitude toward foreign investment.

Starmark Resources Inc., a Canadian

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company, was reported to be exploring several areas for metal deposits. At the Pueblo Nuevo property, 70 kilometers southeast of San José, a rich copper-silver-gold deposit was reported. Starmark estimated over 3.5 million tons of probable ore grading at least 18% copper. One sample was determined to contain 32% copper, 18.3 troy ounces of silver, and 0.76 troy ounce of gold per ton. An unidentified independent geologist reportedly estimated as much as 8 million tons of ore averaging 26% copper, 18 troy ounces of silver, and 0.09 troy ounce of gold per ton. Starmark planned to continue studies for at least 1 year to define the deposit limits and verify metal grades. Second-stage development plans included the installation of a 5- or 10-ton pilot plant to process the ore. It was suggested that some of the ore is of such a high grade it may only require gathering and handsorting prior to shipment. Starmark has options or properties elsewhere in Costa Rica that may contain gold placer deposits.

United Hearne Resources Ltd. and Canadian Barranca Corp., joint owners of Minera Macacona S.A., contracted for the services of the U.S. company Kappers, Cassiday and Associates to operate the Santa Clara gold mine, which has reported reserves of 5 million tons of 0.05 troy ounce of gold per ton. Processing capacity of the mine, which is near Esparaza in Puntarenas Province, increased to 450 tons of ore per day from about 350 tons per day. A planned expansion to 2,000 or more tons of ore per day was not assigned a specific target date, but may be accomplished in several phases. In 1983, a continuous rotary drum agglomerator was commissioned. The new 500-ton-per-day system was to replace the batch agglomerators installed earlier. The new equipment was expected to increase production levels and decrease associated costs.

Coal and lignite occurrences have been reported at various locations in the northern half of Costa Rica. One of these, the Volio deposit, had been under preliminary investigation and appeared to contain subbituminous beds up to 2 meters thick. A more detailed study of this deposit, located near Uatsi in southeastern Limón Province, was scheduled to be undertaken in the future by the U.S. Geological Survey and Bechtel Corp.

The 1982 oil exploration agreement with Petróleos Mexicanos proceeded to the drilling stage during 1983. The first well in the two-well program was spudded in the Talamanca region. Mexico has lent Costa Rica $28 million for this program, as provided in the framework of the San José agreement. The Government continued to study a new petroleum law.

Table 2.—Costa Rica: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	Destinations, 1982	
		United States	Other (principal)
METALS			
Aluminum: Metal including alloys, semimanufactures	752	41	Guatemala 145; Nicaragua 127; West Germany 106.
Copper: Metal including alloys, semimanufactures	3	--	Nicaragua 2; Guatemala 1.
Iron and steel: Metal: Semimanufactures:			
Bars, rods, angles, shapes, sections	458	--	Panama 210; Nicaragua 74; Honduras 20.
Universals, plates, sheets	4,928	--	Nicaragua 2,961; Panama 1,460.
Wire	506	--	Guatemala 172; Panama 131; El Salvador 100.
Tubes, pipes, fittings	1,126	--	Panama 874; Guatemala 142; Colombia 29.
Castings and forgings, rough	1	--	All to Panama.
Lead: Metal including alloys:			
Unwrought	20	--	Do.
Semimanufactures	4	--	All to Nicaragua.
Zinc: Metal including alloys, semimanufactures	5	--	Guatemala 4; Nicaragua 1.
Other: Base metals including alloys, all forms	3	--	All to Guatemala.
NONMETALS			
Abrasives, n.e.s.: Natural: Corundum, emery, pumice, etc	482	--	El Salvador 472; Venezuela 10.
Cement	88,746	1,000	Netherlands Antilles 16,850; Cayman Islands 16,749; Jamaica 12,829.
Diatomite and other infusorial earth	10	--	All to Venezuela.
Gypsum and plaster	4	--	All to Panama.
Lime	358	--	Do.
Sodium compounds, n.e.s.: Carbonate, manufactured	10	--	Do.

See footnotes at end of table.

Table 2.—Costa Rica: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	Destinations, 1982	
		United States	Other (principal)
NONMETALS —Continued			
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	20	--	All to Guatemala.
Worked	93	--	All to Panama.
Quartz and quartzite	15	15	
Sulfur: Sulfuric acid	1,146	--	El Salvador 447; Panama 375; Guatemala 248.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline, motor 42-gallon barrels	493	--	Panama 391.
Mineral jelly and wax do.	71	--	Nicaragua 39; Guatemala 23; Honduras 8.
Kerosine and jet fuel do.	294	--	Panama 248; Honduras 46.
Distillate fuel oil do.	235,169	85	Netherlands Antilles 162,464; Venezuela 68,856.
Lubricants do.	35	NA	NA.
Unspecified do.	42	--	All to Honduras.

NA Not available.

[1] Table prepared by John G. Panulas. Comparable 1981 data not available.

Table 3.—Costa Rica: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	Sources, 1982	
		United States	Other (principal)
METALS			
Aluminum: Metal including alloys:			
Unwrought	26	4	Spain 22.
Semimanufactures	1,822	163	France 767; Venezuela 277; Brazil 202.
Copper: Metal including alloys:			
Unwrought	2	2	
Semimanufactures	1,013	73	Peru 826; Japan 27; West Germany 10.
Iron and steel:			
Iron ore and concentrate	15	--	All from Guatemala.
Metal:			
Scrap	550	395	Panama 152; Canada 3.
Pig iron, cast iron, related materials	127	1	West Germany 70; Brazil 51.
Steel, primary forms	21,134	12,627	Chile 4,000; Japan 278.
Semimanufactures:			
Bars, rods, angles, shapes, sections	4,937	277	Republic of Korea 2,036; Japan 1,654; Nicaragua 316.
Universals, plates, sheets	28,220	1,159	Japan 17,570; Republic of Korea 3,669; France 2,700.
Hoop and strip	357	150	Japan 132; West Germany 30.
Wire	2,886	50	Nicaragua 779; Honduras 622; Japan 420.
Tubes, pipes, fittings	2,793	273	Belgium-Luxembourg 1,172; Japan 336; Brazil 257.
Lead: Metal including alloys:			
Unwrought	72	37	Peru 25; Mexico 10.
Semimanufactures	64	1	Peru 25; Sweden 21; Italy 15.
Nickel: Metal including alloys:			
Unwrought	2	--	All from Canada.
Semimanufactures	9	5	Canada 2; Japan 2.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$1,364	$1,206	Spain $158.
Silver: Metal including alloys, unwrought and partly wrought do.	$42	$3	Panama $4.
Tin: Metal including alloys, unwrought	3	1	Japan 1; United Kingdom 1.
Zinc: Metal including alloys:			
Unwrought	1,305	53	Mexico 533; Canada 403; Peru 305.
Semimanufactures	132	7	Italy 124.
Other: Base metals including alloys, all forms	5	5	

See footnotes at end of table.

Table 3.—Costa Rica: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	Sources, 1982	
		United States	Other (principal)
NONMETALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc	377	72	Mexico 168; Guatemala 116.
Grinding and polishing wheels and stones	44	5	West Germany 15; Brazil 5; Czechoslovakia 4.
Asbestos, crude	1,192	--	Canada 1,132; Republic of South Africa 60.
Boron materials: Oxides and acids	38	7	Netherlands 15; Belgium-Luxembourg 8; West Germany 8.
Cement	1,370	24	Japan 765; Belgium-Luxembourg 376; Republic of Korea 201.
Clays, crude	3,343	1,545	Guatemala 716; El Salvador 672; United Kingdom 354.
Diatomite and other infusorial earth	361	57	Mexico 168; Guatemala 116.
Fertilizer materials: Crude, n.e.s	1,976	1,956	West Germany 20.
Graphite, natural	4	2	Japan 2.
Gypsum and plaster	7,628	32	Mexico 3,393; Nicaragua 2,142; Honduras 1,260.
Lime	244	6	Honduras 146; Guatemala 91.
Mica: Crude including splittings and waste	8	7	NA.
Nitrates, crude	20	--	All from West Germany.
Phosphates, crude	1,956	1,956	
Precious and semiprecious stones other than diamond value, thousands	$6	--	Switzerland $5; Colombia $1.
Salt and brine	2,279	313	Nicaragua 1,934; Honduras 20.
Sodium compounds, n.e.s.:			
Carbonate, manufactured	4,521	3,619	West Germany 367; Netherlands 198; France 196.
Sulfate, manufactured	17	5	West Germany 4; Netherlands 4; Belgium-Luxembourg 3.
Stone, sand and gravel:			
Dimension stone: Crude and partly worked	58	--	Italy 30; Guatemala 28.
Gravel and crushed rock	6,330	5,975	Guatemala 355.
Quartz and quartzite	679	34	Mexico 644.
Sulfur: Sulfuric acid	9	5	West Germany 4.
Other: Crude	681	330	China 133; Guatemala 91.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum:			
Crude thousand 42-gallon barrels	588	246	Venezuela 215.
Refinery products:			
Gasoline, motor do	2,817	--	Venezuela 1,573; Mexico 1,242.
Mineral jelly and wax do	12	6	West Germany 3.
Kerosine and jet fuel do	27	1	Venezuela 21; Guatemala 3.
Distillate fuel oil do	1,288	([2])	Venezuela 1,150; Netherlands Antilles 138.
Lubricants do	113	58	Trinidad and Tobago 28; Netherlands Antilles 10; Nicaragua 7.
Residual fuel oil do	18	18	
Unspecified do	6	1	Nicaragua 5.

NA Not available.

[1] Table prepared by John G. Panulas. Comparable 1981 data not available.

[2] Less than 1/2 unit.

EL SALVADOR[4]

As the smallest and most densely populated continental country in the Western Hemisphere, and with a limited endowment of mineral resources, El Salvador produced a small diversity of mineral commodities—chiefly the precious metals gold and silver. Modest quantities of aluminum, cement, gypsum, and salt were also produced. All crude oil had to be imported for the 17,000-barrel-per-day refinery at the Pacific port of Acajutla operated by Exxon Corp. and Shell Oil Co.

Mine output declined as it has since 1979 owing to civil unrest and guerrilla attacks. The lower mineral output reflected El Salvador's fifth straight year of decline in the (GDP) and in trade with the nations of the Central American Common Market (CACM). In real terms the GDP fell slightly, or was stagnant at an estimated $4 billion[5] at current prices, an improvement over the 5.4% drop in 1982. The value of mineral output was a small fraction of the GDP. Although El Salvador is considered the most industrialized nation within the CACM, the industrial sector, including mining, accounted for only 16% of total national income, compared with the 21% share for commerce and the 40% share for agriculture.

Precious Metals.—El Salvador is the third most important CACM silver producer after Honduras and Nicaragua. Output of silver in 1983 continued the downtrend since 1978 when 185,000 troy ounces was produced and considerably below the peak year of 1971 when 215,000 troy ounces was produced. Similarly, gold output was well below the peak year of 1975 when 8,700 troy ounces was produced. Silver and gold operations take place in the eastern part of the country, the nearest area to Nicaragua, where guerrillas have been most active. The notable drop in gold and silver output was caused by interruptions in the operations of San Cristóbal and San Sabastián, the two most important mines in the precious metals sector. The San Cristóbal gold and silver mine in southern Morazán Department operated intermittenty after shutdown in October 1982. The owner, Javelin International Ltd., continued negotiating for acceptable sales arrangements with the Central Reserve Bank. The San Sebastián gold mine, located in La Unión Department, was attacked in April by guerrillas or other terrorists. Although damage sustained during the attack apparently was not severe, the primary owner, Commerce Group Corp. of Milwaukee, Wisconsin, stopped operations.

At yearend, mining operations at San Sebastián were in a holding pattern. New bank financing to complete the $13 million rehabilitation and expansion program was dependent upon pacification of the area. It was expected that the improved climate of security would enable startup of gold production by yearend 1984. By the end of March 1984, the company projected that investments would total $9.3 million in the project. Under the new mine plan, the traditional underground mine is to be operated as an open pit at 45,000 tons of ore per month. The mill will be revamped and expanded to a capacity of 300 tons per day to give about 40,000 troy ounces of gold per year with 5% to 10% silver content. Projected gold output would increase El Salvador's historic level considerably as well as increase foreign exchange earnings.

Mineral Potential.—The Government of El Salvador has been involved in a $1.5 million geological program begun in 1981 to locate and evaluate economically exploitable mineral deposits, under the direction of the Instituto Salvadoreño de Desarrollo Industrial and the Comisión Nacional de Petróleo. According to Weyl,[6] iron- and titanium-bearing sands are known to exist along the Pacific coast. The Geological Survey Circular 925 states that silver, lead, and zinc deposits should be explored for along the concealed contacts of limestones and younger intrusive igneous rocks. The circular further suggests that the lake deposits should be examined for the presence of amber, which is found in similar deposits in the Dominican Republic.

Energy Resources.—Motivated by the lack of oil discoveries, El Salvador was the first country in Central America to construct and operate electric powerplants driven by geothermal energy. At the Ahuachapán geothermal field, located in the southwestern part of the country south of Santa Ana, three powerplants generate 95 megawatts and provide up to 44% of the country's electricity demand. Exploration began at the Ahuachapán Field in the mid-1960's and by late 1981 the third powerplant had been installed. At Berlin, in the southeastern part of the country in Usulután Department, another promising geothermal field was undergoing exploration in 1983 by the Comisión Ejecutiva Hidroeléctrica del Río Lempa (CEL). The capacity of the field was estimated at 110 megawatts and was expected to be the site of El Salvador's fourth geothermal unit.

Since El Salvador consists primarily of volcanic rocks, it does not have geologic conditions favorable to the formation of deposits of hydrocarbons or coal. The area of the country having the best oil prospects is that part of the narrow Pacific Shelf shared with Nicaragua. Five lignite deposits have been reported in intermontane basins containing young sediments that warrant systematic evaluation. During 1983, no exploration for oil and gas was reported and no rights were held.

Under the Hydrocarbons Law (Decree 626 of March 17, 1981), CEL is also responsible for fossil fuel exploration, exploitation, transportation, sales, and industrialization. To date, CEL's efforts have identified no oil reserves although more exploratory drilling on and offshore was planned. El Salvador continued to import most of its crude oil from Mexico and Venezuela under the San José Accord for financing crude oil purchases. Imported oil in 1982 accounted for 36% of El Salvador's total energy consumption, and only 8% of electricity generated. Under the program to reduce dependency on imported oil, El Salvador by yearend 1983 practically completed construction of the $300 million dam and powerplant at San Lorenzo on the Río Lempa near Puente Cuscatlán with a rated capacity of 180 megawatts. The first generating unit of 90 megawatts was expected to be in service during the first quarter of 1984 and the second unit by mid-1984. The project required about 5 years for its completion. In July 1982, the Interamerican Development Bank (IDB) extended an additional $66 million for completion of this hydroelectric project. The San Lorenzo dam was being constructed by an Italo-Swiss consortium, COGEFAR de Guatemala S.A., in 1983. At yearend, total installed hydroelectric capacity was 412 megawatts, increasing to 592 megawatts by the end of 1984.

Investment.—In late 1983, the IDB approved a $7.5 million loan to the Government to finance the second stage of a preinvestment program. This program was designed to finance general and specific prefeasibility and feasibility studies in a number of economic sectors, including industry (mining), energy, and transportation that will affect mineral development. Guerrilla attacks against the Salvadoran economy, especially its infrastructure, have caused a sharp drop in public and private investment of 15% and 50%, respectively, between 1978 and 1982. The violence and uncertainty created by the guerrilla war have also reduced the flow of private foreign investment in mining and other sectors.

El Salvador's new constitution came into force on December 20, 1983. It establishes a republican, pluralistic form of government; strengthens the legislative and judicial branches; improves safeguards for individual rights; protects the legal basis of the land reform; and provides for a presidential election in March 1984, and legislative and municipal elections in 1985.

In December 1983, El Salvador was designated as a beneficiary under the CBI of the United States to become effective January 1, 1984.

GUATEMALA[4]

As the largest economy and the most populous country in Central America, Guatemala was the sole producer of crude oil and natural gas and produced the greatest diversity of metallic and industrial minerals. In this region, Guatemala was the largest producer of crude steel and semimanufactures, exported primarily to El Salvador and other countries of the CACM. Cement output was the second most important after that of Costa Rica. It had been the leading antimony producer, which also had associated with it minor amounts of tungsten. Guatemala had been the region's only nickel producer at Lake Izabal until operations were suspended in late 1980 because of high fuel oil costs. The development of barite resources initiated in 1978 responded to the growing requirements of the petroleum industry. In 1960, and about 6 years thereafter, Guatemala was a notable producer of silver when output peaked at 663,000 troy ounces. In 1983, INDETA S.A., a producer of steel products located in Aldea San Ignacio, Guatemala Department, was planning to install a 50,000-ton-per-year rolling mill to produce wire, flat bars, and profiles.

Nonfuel Minerals.—Except for mineral fuels, output of most mineral commodities was generally lower in line with the continued economic recession following the slowdown that began in 1980. In real terms, the GDP fell by an estimated 2.5% to $9.2 billion[7] valued at current prices. Manufacturing was crippled by the loss of markets in Central America, which was also in recession and where austerity and the need for economic stabilization generally prevailed. Reduced cement output resulted from the severe depression in the construction industry, particularly as Government-financed projects have been completed or curtailed. Lower mineral output also reflected the 16% drop in fixed investment. The guerrilla insurgency caused damage to the economy, although hard to isolate from other negative factors, and contributed to the sharp decline in foreign private investment since 1982.

Mineral Fuels.—The notable exception to

Guatemala's depressed state was the continued growth in the country's relatively new petroleum industry. The very rapid growth of crude oil production in the early years slowed in 1983 to only an 11% increase. Since crude oil output was first registered in 1976 at the level of 51,000 barrels per year, it has grown impressively at the average rate of 87% per year to a level approaching 3 million barrels per year. The average production rate in 1983 was almost 7,000 barrels per day with a production peak of 8,000 barrels per day in May. At yearend, however, the production rate declined as the two producing consortia ceased exploration and greatly reduced investment to maintain existing wells.

Associated natural gas production increased proportionately with crude oil output. Most of the gas was flared except for the amount used to operate processing plants. Two oil pipelines were in operation, one to transport crude oil from the north-central oilfields to Puerto Barrios in the Caribbean Sea, and the other to carry imported crude from the Port of San José to the refinery at Escuintla operated by the Texas Petroleum Co.

On a world scale, Guatemala is a very minor oil producer. Nonetheless, crude oil exports are becoming increasingly important as an earner of foreign exchange. Although coffee, sugar, and cotton continued to heavily dominate the export sector, oil exports in 1983 (mostly to the United States) were valued at $60 million and represented 5% of total exports compared with the 2% share in 1980. During the year, 2.1 million barrels or 83% of total oil output was exported, an increasing share because of lower domestic demand caused by the recession and because of the development of nonfossil energy sources. Domestic consumption of national crude oil was by a cement company and an electric utility. Guatemala's imports of crude oil and products during the year declined to 7.9 million barrels and were valued at $257 million, compared with imports of 10.8 million barrels costing $344 million in 1980.

Crude oil output was from the Rubelsanto and West Chinaja Oilfields located on the southern flank of the Chapayal-Petén Basin, a geologic extension of the same basin that contains the prolific Reforma Oilfields of southern Mexico. The main oil producer was a consortium of three foreign oil companies headed by Elf Aquitaine Guatemala.

Exploration during the year in the Chapayal-Petén Basin—at a reduced level—involved five areas: Areas AA and E were contracted to a consortium headed by Híspánica de Petróleos, S.A.; area T involved a group headed by Elf Aquitaine Guatemala; and areas D and L, involved a group headed by Texaco Exploration Guatemala Inc. There were no exploration activities in areas D and E. The Yalpemech well in area AA produced intermittently. Well RS-101 and well Tierra Blanca in area T were undergoing production testing. Geological and geophysical studies were underway by Texaco in area L. Exploration activity declined notably during the year in anticipation of the new petroleum law under preparation. Only four wells were drilled in 1983 involving 10,000 meters compared with nine wells drilled in 1981 involving 33,000 meters of drilling.

In September, the Government promulgated a new hydrocarbons law (Ley de Hidrocarburos) by Decree Law No. 109-83 to replace the Ley de Régimen Petrolero de la Nación of 1955. The associated regulations were published in December as Government Edict 1034-83 and the model contract governing oil-production sharing was expected to be published in spring 1984. The new law was designed to make oil exploration and production more attractive to foreign investment.

Energy Resources.—The Dirección General de Hidrocarburos reported that as of September 30, 1983, proven reserves of crude oil in the Chapayal-Petén Basin amounted to 11.3 million barrels. Geological Survey Circular 925 pointed out that the changing character of producing formations southeast of the Mexican fields casts doubt on the possibility that oil deposits of major size will be found in Guatemala. Coal has been reported in 11 of Guatemala's 22 Departments, but little information on the character and extent of the coalbeds is available. The general geology of Guatemala suggests that coal of three different geologic ages with varying coal rank (bituminous, subbituminous, and lignite) may be present.

Guatemala's mountainous terrain and abundant rainfall provide good hydroelectric potential now being harnessed. The country has 400 megawatts of installed capacity out of a hydroelectric potential of about 4,300 megawatts. Some reduction in the consumption of fossil fuels was made possible by the 90-megawatt Aguacapa project started up in late 1981. The completed

300-megawatt Chixoy project began testing its generating equipment in June, but problems of damage to the diversion tunnel will delay full production until late 1984. Construction of the 440-megawatt Chulac project, estimated to cost over $1 billion, has been postponed after completion of some preliminary works because of budgetary and foreign exchange constraints.

At Zunil in western Guatemala, a small high-temperature geothermal reservoir was confirmed by drilling. The Government was planning to construct two geothermal powerplants. Another geothermal field, Amititlán, south of Guatemala City, was also of interest.

The annual meeting of the Latin American Energy Organization (OLADE) was held in Guatemala in November and was attended by 19 Latin American countries. There were no major policy pronouncements. Guatemala's Minister of Energy and Mines became the new President of OLADE. A regional petroleum study center is to be setup in Guatemala's national university with the help of OLADE and national oil companies in the region to retrain technical personnel from other industries.

Trade.—In December, Guatemala was designated as a beneficiary country under the CBI to be effective January 1, 1984. Under the CBI, Guatemala would receive trade benefits more generous than those provided under the General System of Preferences. The CBI provides more liberal access to duty-free treatment, broader product scope, the absence of "competitive need" limits, and more lenient value-added requirements in the rules of origin.

In late November, Guatemala imposed new restrictions on trade with its Central American neighbors, including a requirement that all exports to El Salvador had to be registered and had to have official permits. This measure climaxed 2 years of differences over trade and payments issues. The Government of Guatemala was concerned over two issues, the large overdue debt owed by El Salvador through CACM's clearinghouse mechanism and the growth of El Salvador's parallel foreign exchange market.

HONDURAS[4]

Honduras is the most important producer of silver in Central America but at a level that is only 5% of the world-scale output of Mexico and Peru. Honduras is also the leader in the region in the production of lead and zinc recovered as coproducts with silver in the same polymetallic ore. Other than the silver, lead, and zinc mined for the export markets, the country produced a small variety of industrial minerals for the domestic market. There was no crude oil output and a small refinery was in operation to satisfy internal demand.

During the year, mineral output was generally stagnant in accordance with the recession of the national economy. Contrary to this trend, output of silver rebounded from the downtrend that began in 1976, but fell far short of the historic peak of 4.4 million troy ounces achieved in 1968. Lead output also increased substantially while zinc output was at an alltime high.

After 4 years of unprecedented real growth averaging over 7.5% per year in the late 1970's, Honduras entered a sharp recessionary period beginning in 1980. Figures for 1983 indicate a continued decline in national income by 0.7% to an estimated $3.0 billion[8] at current prices.

The mineral sector of Honduras was dominated by the El Mochito Mine operations located in Santa Bárbara Department west of Lake Yojoa and south of San Pedro Sula, an important industrial district. This mine is the largest working mine in Central America in terms of total mining production and diversity of mineral products. The El Mochito Mine, discovered in 1938, has been operated since 1948 by the Rosario Resources Corp., a subsidiary of AMAX Inc. since 1980. This subsidiary had operated the very profitable Rosario silver mine in San Juancito near Tegucigalpa until it was exhausted in 1954. After a downtrending period, El Mochito's silver, lead, and zinc production in 1983 increased sharply as a result of increased ore milling capacity and higher ore grades encountered. Although the amount of ore milled increased only 4%, silver, lead and zinc output increased, respectively, 22%, 28%, and 55%. In fact, zinc output reached the highest level in 35 years. Most of the ore was mined in the San Juan ore body, where proven reserves have expanded in recent years, while reserves at the Main and Yojoa ore bodies have declined.

At yearend the ore-processing mill at El Mochito was nearing completion to 2,800 tons per day and expected to be at full capacity in 1985. About 75% of the silver was recovered in the lead concentrate and the balance in the zinc concentrate. Prior to 1973, silver had been produced as doré bullion. The concentrate produced after flotation also contained minor amounts of gold and cadmium. The lead-silver concentrate was transported by truck to the port of Puerto Cortés and shipped to ASARCO Incorporated's smelter-refinery at El Paso, Texas; while the zinc-silver concentrate was shipped to AMAX's smelter in Missouri and to other contract buyers.

Table 4.—Honduras: El Mochito Mine, production and ore reserves

	1977	1978	1979	1980	1981	1982	1983
PRODUCTION							
Ore mined ---- thousand tons--	326	374	363	331	343	432	447
Lead ---- percent--	6.3	5.8	5.1	4.5	4.3	4.0	4.9
Zinc ---- do----	8.1	6.4	6.8	6.2	6.1	7.0	9.1
Content of concentrate:							
Silver ---- thousand troy ounces--	2,819	2,788	2,186	1,721	1,667	2,052	2,496
Gold ---- troy ounces--	1,990	2,034	1,568	1,485	1,242	1,553	2,098
Lead ---- metric tons--	20,604	21,804	16,416	13,315	12,592	15,120	19,290
Zinc ---- do----	26,542	24,339	19,845	16,026	16,190	24,554	37,980
Cadmium ---- do----	263	274	223	175	177	270	386
RESERVES, MEASURED							
Ore ---- thousand tons--	5,870	7,170	7,170	7,170	6,890	6,710	5,990
Content:							
Silver ---- troy ounces per ton--	4.9	4.4	4.4	4.0	4.4	4.2	4.2
Lead ---- percent--	4.9	4.5	4.6	4.2	4.6	4.6	4.6
Zinc ---- do----	8.2	8.5	8.7	8.0	8.8	9.0	8.7
Gold ---- troy ounces per ton--	0.002	0.002	0.002	0.002	0.002	0.002	0.002

Source: Annual reports of Rosario Resources Corp. (1977-78); and Amax Inc. (1980-83).

El Mochito was engaged in expanding its mining capacity to match the expanded mill capacity. Mine capacity was planned to increase to 520,000 tons per year in 1984 and meet mill capacity of about 900,000 tons by 1987. The new trackless mining system was undergoing testing to be fully operational in 1984 together with the new tailings dam.

The $85 million Agalteca iron and steel project to produce 100,000 tons per year of steel continued in the engineering phase. The proposed plant will take advantage of a significant iron ore deposit in the Agalteca region. The Corporación Nacional de Inversiones was planning a slaked lime plant.

The sharp rebound in production of petroleum products reflects the return to full-time operation of the refinery located on the Caribbean coast at Puerto Cortés. The drop in output in 1981 and 1982 resulted from the shutdown during the period September 1981-82. Honduras' only refinery, with a capacity of 14,000 barrels per day, is operated by Refinería Texaco de Honduras S.A. Most of the crude oil used in 1983 was imported chiefly from Venezuela (90%) and from Mexico (10%). The Government announced that Petróleos de Yojoa S.A. has begun drilling onshore in Comayagua Department.

In late April, the Honduran National Congress approved Government Decree No. 94 under which the Government controls the purchase and sale of petroleum and its byproducts. To serve this purpose, a new state company was created in May, the Comisión Administradora de la Compra, Venta y Comercialización del Petróleo.

Mineral Potential.—The year 1983 marked the end of Honduras' 5-year plan to develop the country's mineral potential more fully. During this period, further exploration was accomplished to determine the size of the silver-copper-zinc deposits in Olancho Department. The Government was seeking aid from the IDB to finance technical assistance for a national mineral resources inventory. The Geological Survey has provided a summary work plan for the project at the request of this bank.

Rosario Resources was negotiating with the Dirección General de Minas e Hidrocarburos for a concession to explore and develop the Vueltas del Río gold prospect near the Chamelecón River in western Honduras, about 20 kilometers from the Guatemala border. An agreement was expected to be signed in early 1984. Honduras received assistance from the United Nations and Japan in projects involving gold occurrences in Zopotal and Laguna Seca.

Energy Resources.—Oil and gas have been sought in Honduras onshore in the coastal plain, in small intermontane basins, and offshore in the Caribbean. To date no discoveries have been made, but oil seeps have been reported, particularly around Yojoa. According to the referenced Geological Survey report,[9] the most favorable area is offshore in the Caribbean where thick layers of carbonate and clastic rocks are present on the Nicaragua Rise. Drilling to depths of 15,000 feet has not revealed the presence of source rocks or of temperatures that would lead to hydrocarbon development. A sedimentary basin in Olancho was thought to have some potential, but fieldwork has revealed the basin to be small and unlikely as a repository for commercially extractable hydrocarbons.

Honduras was implementing the final stages of a $3 million International Bank for Reconstruction and Development (World Bank) loan, approved in 1980, to provide technical assistance and training to promote petroleum exploration. The project was designed to support the Government's efforts to discover petroleum by encouraging foreign oil companies to explore the most promising offshore areas of Honduras. It will also strengthen the Government's capability to negotiate and supervise exploration contracts and to improve its energy planning. Sunmark Corp. of Houston, Texas, was contracted to analyze all data obtained from earlier exploratory efforts and to develop a library of information on petroleum exploration and the oil potential of Honduras.

Coal has been reported in 10 localities in Honduras and lignite has been reported in 4 localities. Limited available data indicate that coalbeds more than 1-meter thick are present in several localities, with one bed ranging from 2 to 5 meters reported. Most of the coalbeds have high ash content but low to medium sulfur content.

Honduras was engaged in exploiting its largely untapped hydroelectric potential estimated at 4,000 megawatts. The $58 million, 22.5-megawatt Nispero hydroelectric plant on the Palaja River in Santa Bárbara Department, completed in 1982, was in service in 1983 under the operation of the Empresa Nacional de Energía Eléctrica. This gave Honduras an installed capacity of about 235 megawatts. The $684 million, 292-megawatt El Cajón hydroelectric project on the Humuya River was under construction and about 50% completed by yearend. When fully in service in 1986, EL Cajón will supply nearly all of the country's electricity needs and reduce dependence on oil by 20%.

Trade and Investment.—As a consequence of the sharp increase in output of silver, lead, and zinc and the improved world economy, earnings from exports in the metals category rebounded from the depressed level of 1982. Preliminary data indicate that the relative importance of metals in the export sector increased from fifth to third place behind bananas and coffee. Nonetheless, in 1983 exports of metals represented less than 7% of total exports. The United States took almost all exports of minerals and 44% of Honduras total exports while supplying 26% of the total imports. Crude oil was the most important import item.

In early 1983, the Government initiated negotiation of a bilateral investment treaty with the United States that was continuing at yearend. Government policy is to maintain an open door to foreign investment, although foreign investors have sometimes had difficulties in both red tape and currency conversion. In recent years, Honduras has attracted new foreign investment in mining, metal working, and petroleum exploration, among other sectors. The Government offers duty-free import of materials and equipment to firms qualifying under the Industrial Incentive Law. The Free Zone at Puerto Cortés offers basic facilities to export-oriented manufacturers at local wage rates. Honduras approved a new export incentive law in November.

NICARAGUA[2]

Activity in the minerals sector remained at about the same level as that of 1982. Exploration assistance agreements were negotiated with several foreign governments, some improvements were initiated at existing mines, and studies were undertaken or completed on the reactivation of old mines. In the energy sector, Nicaragua struggled to maintain normal supply patterns against destructive actions by counterrevolutionaries. Programs designed to relieve dependence on foreign energy sources were studied and in some instances electrical power projects were initiated or completed.

The negative influences on Nicaragua's economic growth and financial resources could affect the scheduled completion date for some planned mining, energy, and infrastructure projects. However, development assistance agreements, loans, and lines of credit were made available to Nicaragua by various foreign governments, including European, Latin American, and some member countries of the Council for Mutual Economic Assistance.

The Government's midyear projection for a 3% real economic growth rate for 1983 became questionable as the year progressed and productivity in many sectors apparently declined. Destructive acts by anti-Government armed forces increased noticeably and were predicated to damage Nicaragua's economic base and infrastructure. Protective measures and repairs absorbed work force and financial resources that might otherwise have been used to promote a healthier economy.

As part of an infrastructual development plan sponsored by the U.S.S.R., Nicaraguan and Cuban technicians began cooperating in the construction of a new international standard gauge trans-Nicaraguan railroad system. The system is to replace the existing railway that suffered extensive damage from a 1982 hurricane. When completed, the project will link Puerto Corinto on the northwestern Pacific coast to El Bluff on the eastern Caribbean coast. Work on the first 22 kilometers of this ambitious rail system was undertaken in mid-1983. It joins Puerto Corinto to Chinandega, located northeast of the port city. The next section was scheduled to extend 129 kilometers southeast to Managua. The Corinto-Chinandega-Managua route was expected to cost about $200 million and require 3 to 4 years for completion. Another $300 million was estimated for the future sections that will run from Managua through Grenada, Boaco, Chontales, Zelaya Sur, El Rama, and finally to El Bluff where deepwater port facilities were also to be constructed. The time schedule for completion of the whole rail system was projected at 7 to 10 years. Much of the construction cost was expected to be incurred in local currency with payments coming from central Government funds. Rolling stock, locomotives, rails, and other equipment were to be financed through lines of credit from foreign sources. Given Nicaragua's strained financial resources, completion of the railroad system could take longer than anticipated, depending on the financing made available.

The Government signed an agreement with Rosario Mining of Nicaragua Inc. on the settlement of claims related to the 1979 expropriation of Rosario's La Rosita and Siuna mining properties. Nicaragua agreed to pay Rosario $8.8 million for the gold and silver bullion inventory confiscated by the Government. The sum included an original bullion value of $4.5 million plus interest and increased value. The agreement was similar to the one reached between the Government and Neptune Mining Co. in 1982. In each instance provision for a second settlement covering property values, taxes, and other matters, was submitted to international arbitration under procedures set by the United Nations Commission on International Trade.

The Brazilian state-owned company Cia. de Pesquisa de Recursos Minerais (CPRM) conducted a prefeasibility study on the El Topazio gold mine in Zelaya Province in eastern Nicaragua in 1982. In 1983, CPRM initiated studies on an alluvial gold deposit and on the reactivation of the Quinzilala Mine.

At the El Limón Mine in León Province, formerly majority-owned by Noranda Mines Ltd. through Empresa Minera de El Setentrión, a total of $5 million has been invested in improvements to pumping, ventilation, and transport facilities. In 1983, another $1 million investment was planned to install new crushers, washers, and cyanide circuits to increase gold output above the 3,500 troy ounces per month Nicaragua claimed this mine produced. The mine is located near active volcanoes and very high-temperature water had invaded the mine after Noranda departed. This water has finally been pumped out and the rich deeper veins, averaging 0.3 troy ounce per ton, were again minable. Proven ore reserves were estimated at 250,000 tons with possible reserves as high as 1 million tons.

Nicaragua brought its first geothermal powerplant on-line in August. The 35-megawatt plant, located 50 kilometers northwest of Managua at the foot of the Momotombo volcano, was expected to supply 12% of Nicaragua's energy needs. Named Patricio Argüello Ryan, the $45 million plant was expected to save $14 million per year in imported oil costs. Italy provided the major part of the project financing, with lesser contributions by France, Mexico, the Netherlands, and Belgium. A similar geothermal plant was planned for a nearby location.

Studies have shown that Nicaragua has a very high potential for geothermal electrical power. There are at least 38 volcanic structures and the country is geologically active. The Government estimated that by the end of this century as much as 50% of Nicaragua's electricity needs could be supplied by geothermal plants. At the end of 1983, installed national electrical network capacity was about 341 megawatts, with additional capacity from private industrial and mining sources amounting to 58 megawatts. About 40% of the national network capacity came from hydroelectric or geothermal plants. At least eight new major hydroelectric or geothermal plants were planned for completion during the next 10-year period. The completion of these and related projects would require an investment of about $930 million and add 372 megawatts to total installed electrical capacity. Financial assistance was expected to come from various international organizations and foreign governments.

Table 5.—Nicaragua: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Iron and steel: Metal:				
Scrap	3,325	3,569	--	Colombia 3,382; El Salvador 162; Guatemala 21.
Steel, primary forms	NA	3	--	All to Costa Rica.
Semimanufactures:				
Bars, rods, angles, shapes, sections	1,508	241	--	Do.
Universals, plates, sheets	NA	19	--	Do.
Hoop and strip	20	NA		
Wire	1,284	1,336	--	Costa Rica 795; Guatemala 308; El Salvador 210.
Tubes, pipes, fittings	294	92	--	Costa Rica 89; Honduras 3.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$992	NA		
NONMETALS				
Asbestos, crude	1,343	NA		
Gypsum and plaster	9,206	2,100	--	All to Costa Rica.
Lime	82	296	--	All to Cuba.
Salt and brine	6,073	2,180	--	Costa Rica 1,964; Guatemala 216.
Sodium compounds, n.e.s.: Carbonate, manufactured	NA	18	--	All to El Salvador.
Stone, sand and gravel	NA	2,123	--	All to Costa Rica.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Gasoline, motor 42-gallon barrels	--	1,267	--	All to Costa Rica.
Kerosine and jet fuel do	19,375	4,812	--	Costa Rica 3,348; El Salvador 325.
Distillate fuel oil do	NA	208	--	All to Cuba.
Lubricants do	39,465	31,927	--	Guatemala 14,021; Costa Rica 11,368.
Residual fuel oil do	2,997	4,436	--	Netherlanas 3,410; Cuba 846.
Unspecified do	26,103	8,568	--	Costa Rica 4,914; Honduras 3,654.

NA Not available.

[1] Table prepared by John G. Panulas.

Table 6.—Nicaragua: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	640	485	36	El Salvador 147; Costa Rica 130; Guatemala 106.
Copper: Metal including alloys, all forms	[2]161	118	19	Mexico 63; Spain 15; Italy 6.
Iron and steel: Metal:				
Pig iron, cast iron, related materials	243	709	2	North Korea 610; Mexico 97.
Steel, primary forms	7,645	13,269	1,275	Chile 5,499; Argentina 4,468; France 1,934.
Semimanufactures:				
Bars, rods, angles, shapes, sections	3,673	3,746	221	Cuba 2,843; Panama 213.
Universals, plates, sheets	20,556	22,149	1,135	France 15,214; Spain 1,860; Cuba 1,082.
Hoop and strip	160	1,004	13	France 406; United Kingdom 237.

See footnotes at end of table.

Table 6.—Nicaragua: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel: Metal —Continued				
Semimanufactures —Continued				
Rails and accessories	174	1,214	3	Spain 1,211.
Wire	5,780	21,298	1,330	France 18,709; Brazil 1,000.
Tubes, pipes, fittings	5,470	2,521	304	Cuba 836; Italy 786; France 145.
Castings and forgings, rough	27	119	15	Colombia 10.
Lead: Metal including alloys:				
Unwrought	80	43	1	Mexico 42.
Semimanufactures	NA	7	6	NA.
Nickel: Metal including alloys, all forms	--	1	--	All from Portugal.
Tin: Metal including alloys:				
Unwrought	24	20	3	United Kingdom 13; West Germany 2; Netherlands 2.
Semimanufactures	6	5	--	Denmark 2; West Germany 2.
Zinc: Metal including alloys:				
Unwrought	302	470	--	All from Mexico.
Semimanufactures	110	89	21	Costa Rica 37; Mexico 30.
Other: Base metals including alloys, all forms	15	8	8	
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	578	241	174	Mexico 66.
Grinding and polishing wheels and stones	124	183	--	Costa Rica 155; West Germany 6.
Asbestos, crude	1,343	NA		
Boron materials: Oxides and acids	--	8	3	France 3; Netherlands 1.
Cement	250	19,834	--	Cuba 19,620; Belgium-Luxembourg 207.
Clays, crude	412	203	62	Guatemala 120; Mexico 14.
Diatomite and other infusorial earth	545	234	167	Mexico 66.
Fertilizer materials: Manufactured:				
Nitrogenous	69,065	NA		
Phosphatic	16,288	NA		
Potassic	20,971	NA		
Unspecified and mixed	13,117	NA		
Fluorspar	--	1	--	All from West Germany.
Graphite, natural	30	33	--	Guatemala 20; West Germany 13.
Gypsum and plaster	17	21	--	All from United Kingdom.
Salt and brine	32,795	14,037	14,029	El Salvador 6; Costa Rica 1.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	834	849	11	East Germany 651; Denmark 86; West Germany 44.
Sulfate, manufactured	NA	10	9	East Germany 1.
Stone, sand and gravel:				
Quartz and quartzite	277	60	58	Mexico 2.
Sand and gravel	NA	44	--	Guatemala 31; West Germany 13.
Sulfur: Sulfuric acid	397	709	123	West Germany 578.
Talc, steatite, soapstone, pyrophyllite	323	127	1	Guatemala 39; China 33; Italy 25.
Other: Crude	NA	22	1	Guatemala 21.
MINERAL FUELS AND RELATED MATERIALS				
Coal: All grades including briquets	--	193	167	West Germany 26.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	18,780	4,247	21	Mexico 3,214; Venezuela 1,010.
Gasoline, motor do	72	116	1	Netherlands Antilles 55; Mexico 51; Panama 9.
Mineral jelly and wax do	10	2	1	Japan 1.
Kerosine and jet fuel do	110	659	--	All to Panama.
Lubricants do	44	41	14	Netherlands Antilles 17; El Salvador 8.
Residual fuel oil do	119	289	--	Mexico 149; Panama 92; Netherlands Antilles 48.
Unspecified do	637	140	105	Panama 21; Guatemala 14.

NA Not available.
[1] Table prepared by John G. Panulas.
[2] Excludes scrap.

PANAMA[2]

The 1982 decision of Rio Tinto Zinc Corp. Ltd. and state-owned Corporación de Desarrollo Minero Cerro Colorado to delay development of the Cerro Colorado copper mining project was reaffirmed in early 1983. The international copper market remained depressed throughout the year and the project was not reactivated.

Panama's mineral production was limited to construction-oriented materials and there appeared to be no short-term prospects for significant new mineral exploration or development.

In addition to the copper and molybdenum deposits at Cerro Colorado and Petaquilla, known mineral resources include aluminum, gold, titanium, platinum, manganese, and phosphates. Most of Panama is covered by volcanics with some areas of intrusive and ultramafic rocks. Areas of thick sedimentary deposits may have hydrocarbon potential. Lignite and subbituminous coal occurrences have been reported, but systematic exploration or appraisal remain to be undertaken.

Panama's economy continued to be affected by declining investment, the recessionary economies of its regional trading partners, and depressed prices for traditional exports. Generally unstable political situations in other Central American countries were reflected in curtailed activity in most of Panama's economic sectors. Real economic growth was estimated at under 1%. Inflation steadily decreased and was estimated at 3% for 1983, although the measurement included food items subjected to price control. A structured economic adjustment program was devised and it targeted growth goals for the various sectors. Financial assistance for the planned economic program was to be provided by loans from the World Bank and other lending institutions.

Panama's hydroelectric potential was estimated at 2,500 megawatts, but only a small percentage has been utilized or was under active development. Loans were obtained to complete the 300-megawatt Fortuna hydroelectric power project on the Chiriquí River, about 35 kilometers northwest of David in southwestern Panama. Adverse geological conditions affected the construction progress and design modifications were required. The completion date was rescheduled for October 1984. The Fortuna project and the planned 264-megawatt Changuinola I hydroelectric project should enable Panama to substantially reduce its oil import requirements.

In 1983, a trinational committee continued to discuss the problem of either enlarging the present Panama Canal or constructing an entirely new parallel sea-level waterway at a cost estimated as high as $30 billion. The committee members are composed of delegates from Panama, the United States, and Japan. A consensus among the committee members regarding which of several alternative actions would be most acceptable was not reached in 1983, but a decision may be made at a mid-1984 meeting. The United States-Panama treaties stipulated that an estimated $30 million in studies for a new canal be completed by the end of 1999 when Panama assumes full responsibility for the canal.

Another isthmus sea-level waterway was under preliminary study by a Colombian-Panamanian commission. This waterway would involve the construction of a 135-mile, shallow-draft passage designed to carry vessels up to 10,000 tons. The latest and cheapest route under consideration involved an entry on the Caribbean coast at Colombia's Gulf of Urabá (Gulf of Darién), up the Atrato and Cacarica Rivers to the international frontier from whence a 10-mile channel would be cut to intersect Panama's Paya and Tuira River systems, exiting at the Gulf of San Miguel on the Panamanian Pacific side of the isthmus. The estimated cost of the waterway was $2 billion. Once a decision has been made among the various routes under consideration, detailed studies will require between 2 and 3 years and construction another 5 years. In addition to providing access to small ships involved in Central and South American trade, the waterway would open the area to a variety of other economic activities. Planned hydroelectric projects and coincidental drainage of swampland would add greatly to development opportunities.

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[1] Cunningham, C. G., R. W. Fary, Jr., M. Guffanti, D. Laura, M. P. Lee, C. D. Masters, R. L. Miller, F. Quinones, R. W. Peebles, J. A. Reinemund, and D. P. Russ. Earth and Water Resources and Hazards in Central America. U.S. Geol. Surv. Circ. 925, 1984, 40 pp.

[2] By Doris M. Hyde, physical scientist, Division of Foreign Data.

[3] Where necessary, values have been converted from Costa Rican cólones (¢) to U.S. dollars at the rate of ¢42.22=US$1.00.

[4] By Orlando Martino, physical scientist, Division of Foreign Data.

[5] Where necessary, values have been converted from Salvadoran cólones (¢) to U.S. dollars at the official rate of ¢2.50=US$1.00. (The parallel rate was ¢3.90=US$1.00).

[6] Weyl, R. Geology of Central America. Berlin Gebrudr Borntraeger, 2d ed., 1980, 371 pp.

[7] Where necessary, values have been converted from Guatemalan quetzals (Q) to U.S. dollars at the rate of Q1.00=US$1.00.

[8] Where necessary, values have been converted from Honduran lempiras (L) to U.S. dollars at the rate of L2.00=US$1.00.

[9] Page 25 of work cited in footnote 1.

Table 7.—Panama: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
Aluminum: Metal including alloys, all forms	256	158	91	Costa Rica 63; Colombia 3.
Copper: Metal including alloys, all forms	20	NA		
Iron and steel: Metal:				
Scrap	3,272	1,018	1,018	
Steel, primary forms	24	12	--	All to Costa Rica.
Semimanufactures: Bars, rods, angles, shapes, sections	80	200	--	Nicaragua 180; Costa Rica 20.
Lead: Metal including alloys, all forms	410	520	--	All to Ecuador.
Petroleum refinery products thousand 42-gallon barrels	NA	2,597	238	Honduras 294; Nicaragua 14.
Other: Base metals including alloys, all forms	1,946	NA		

NA Not available.

[1] Table prepared by John G. Panulas.

Table 8.—Panama: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	2,265	2,576	926	France 868; Costa Rica 334.
Copper: Metal including alloys, all forms	649	754	158	Chile 413; Costa Rica 72.
Iron and steel: Metal:				
Scrap	21	114	--	Costa Rica 11.
Pig iron, cast iron, related materials	21,393	14,806	2,094	Chile 8,699; Brazil 3.
Ferroalloys	55	141	11	Brazil 130.
Steel, primary forms	13,198	17,242	2,566	United Kingdom 8,617; France 1,654.
Semimanufactures:				
Bars, rods, angles, shapes, sections	11,760	15,738	2,587	Brazil 3,300; Belgium-Luxembourg 2,123; Republic of Korea 2,077.
Universals, plates, sheets	29,579	27,921	2,485	Japan 10,861; Republic of Korea 4,556; France 2,401.
Hoop and strip	1,374	560	46	Japan 461; Brazil 20.
Rails and accessories	192	495	424	Italy 71.
Wire	6,759	5,273	205	Brazil 2,098; Republic of Korea 1,899.
Tubes, pipes, fittings	13,198	NA		
Castings and forgings, rough	54	4	4	
Lead: Metal including alloys, all forms	195	279	14	Costa Rica 260; Denmark 5.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$79	$55	$54	NA.
Tin: Metal including alloys, all forms	8	9	2	Bolivia 2; Peru 2; West Germany 1.
Zinc: Metal including alloys, all forms	407	420	24	Peru 309; Canada 74.
Other: Base metals including alloys, all forms	33	24	21	Austria 1.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	79	5	3	Norway 2.
Asbestos, crude	^{r}241	320	--	All from Canada.
Cement	4,809	8,202	36	Colombia 4,377; Costa Rica 2,450.
Clays, crude	799	817	660	El Salvador 153.
Diatomite and other infusorial earth	439	443	243	Mexico 200.
Feldspar, fluorspar, related materials	1,034	430	60	Guatemala 370.
Fertilizer materials: Manufactured:				
Nitrogenous	23,940	17,217	8,174	West Germany 7,413; Costa Rica 1,241.
Phosphatic	6,724	6,068	5,563	Costa Rica 304; Netherlands 199.
Potassic	1,480	7,501	4,050	West Germany 3,400.
Unspecified and mixed	42,676	26,341	15,407	Costa Rica 5,583; West Germany 4,716.
Gypsum and plaster	9,284	9,530	139	Dominican Republic 9,361.
Lime	1,555	1,401	831	Costa Rica 559.
Mica: Crude including splittings and waste	32	32	32	
Precious and semiprecious stones other than diamond -- value, thousands	$276	$297	$72	United Kingdom $110; Hong Kong $24.
Salt and brine	6,949	8,713	434	Colombia 5,250; Ecuador 2,500.

See footnotes at end of table.

Table 8.—Panama: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Sodium compounds, n.e.s.:				
Carbonate, manufactured	2,882	3,390	3,068	France 160; West Germany 80.
Sulfate, manufactured	NA	2,649	200	Mexico 2,398.
Stone, sand and gravel:				
Dimension stone, crude	833	689	2	Italy 528; Guatemala 66.
Limestone other than dimension	3,654	3,165	--	Mainly from Costa Rica.
Sand other than metal-bearing	6,710	6,435	6,429	Spain 5.
Talc, steatite, soapstone, pyrophyllite	551	206	146	Colombia 10.
MINERAL FUELS AND RELATED MATERIALS				
Coal: All grades including briquets	180	101	100	Netherlands 1.
Coke and semicoke	143	61	NA	NA.
Petroleum:				
Crude thousand 42-gallon barrels	[r]10,444	11,976	8	Venezuela 4,730; Mexico 4,530; Ecuador 2,678.
Refinery products:				
Gasoline, motor do.	1,240	3,014	(2)	Netherlands Antilles 210; Trinidad and Tobago 117.
Mineral jelly and wax do.	11	12	2	Japan 5; Hong Kong 1.
Kerosine and jet fuel do.	7	7	3	Netherlands Antilles 3.
Lubricants do.	55	33	32	Netherlands Antilles 1.
Residual fuel oil do.	8	6	(2)	NA.
Unspecified do.	4	5	3	Mexico 1.

[r] Revised. NA Not available.

[1] Table prepared by John G. Panulas.

[2] Less than 1/2 unit.

The Mineral Industry of Other Areas of the Far East and South Asia

By E. Chin, Charles L. Kimbell, Gordon L. Kinney, and John C. Wu

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BANGLADESH[1]

Natural gas was the only economically significant mineral produced. A significant amount of the gas output was consumed in the production of nitrogen fertilizer and electric power. Proved reserves of natural gas were abundant and at least sufficient to supply most of the country's industrial and domestic needs for many decades to come.

Other mineral production was of little importance to the Bangladesh economy, although there were prospects for developing some of the nonmetallic minerals. The flat river-delta terrain comprising nearly all of Bangladesh made the potential for discovering major, economically exploitable mineral deposits poor. The deep sediments, however, have good potential for crude oil or additional natural gas discoveries.

The current population crowding and growth rate of about 2.6% per year were the most critical long-term problems facing the country. Economic development was hindered by the 95 million population (eighth in the world) being crowded into a land area of only 144,000 square kilometers or smaller than the State of Illinois. The average population density of 660 persons per square kilometer was one of the highest rural densities in the world.

The Bangladesh Bank in its annual report for fiscal year (FY) 1982 [2] stated that the performance of the economy showed notable improvement during the year. Gross domestic product (GDP) in real terms increased by about 3.7%. The growth was largely attributable to the agricultural sector, which had a much better year than in FY 1981. The industrial sector, which accounts for a relatively small proportion of the economy, increased by 4.4% compared with an increase of 2.9% in FY 1981. Average per capita income increased by 1.3% compared with a decline of 1.6% in FY 1981.[3] The average inflation rate was between 11% and 12%.

Bangladesh's industrial development starts from a very small base, most of which has been in the public sector. The country has almost no natural resources other than agricultural products and natural gas. The nation lacked people with industrial management experience, and skilled and semiskilled labor was in short supply. Nevertheless, the immediate potential for growth in the economy was highest in the industrial sector, which represents only 8% of GDP. This potential was due mainly to a dramatic campaign to return many government-owned industries to the private sector begun by the administration that came to power in March 1982. In June 1982, the Government announced a new industrial policy, which began the process of removing both real and psychological barriers to private investments, accelerated divestment of public sector industry, and increased the promotion of foreign investment. Most of the early divestments have been in the jute and textile industries. In addition, the Government has also promised to sell its shares in foreign-controlled joint ventures and 49% of the shares of all public sector industrial units in a revitalized stock market. It has already offered to the highest bidder more than 90 industrial units and has plans to divest most of its industry, retaining only a few special sectors and very large uneconomic industries.

One of the problems plaguing the economy and hindering industrial growth has been the electric power situation. There was an overall general shortage of electric power, and the distribution system was old and inefficient. Most of the power was generated in the east using very low-cost natural gas as fuel. This has left the western part of the country with only a few oil-fired thermal plants, generating power at up to 18 times the cost of the eastern plants.

In an effort to even out the power supply and equalize costs, the Government has been installing a major east-west interconnector power transmission line. The initial circuit opened in 1982 at 132 kilovolts and a capacity of 200 megawatts. During 1983, the system was being upgraded to a 230-kilovolt double circuit line. Substations at Tongi and Ishurdi were being expanded to enable the interconnector to transfer up to 400 megawatts of power. Additional plans called for the upgrading and expansion of the distribution network in the larger cities.

Industrial production registered a growth of less than 1% compared with 2.9% in calendar year (CY) 1982. Production of cement, triple superphosphate, urea fertilizer, and natural gas increased.

In the trade sector, total export earnings in FY 1982 were $679 million, a 29% increase over those of FY 1981. The value of import licenses issued in FY 1982 was $1,213 million. Foreign aid disbursement increased nearly 9% to $1,346 million.[4] The only important mineral export was urea fertilizer. It was decided to export some of an expected small surplus in order to earn foreign exchange. India and Nepal were to receive most of the urea. Burma, China, Indonesia, and Nepal have received Bangladesh fertilizer in the past.

By far the most important and debilitating mineral imports were crude oil and refined petroleum products. These imports used more than 80% of the export earnings in CY 1982.

COMMODITY REVIEW

Natural gas reserves for Bangladesh have been estimated over a considerable range during the last few years. The most conservative sources stated 7 trillion cubic feet, which was probably an absolute minimum figure. Bangladesh press sources have published figures of 10 to 11 trillion cubic feet, and petroleum industry journals have mentioned figures of 8.8, 11.6, 13.0, and 15.5 trillion cubic feet during 1983. Exploration of promising structures in the country was by no means complete and additional discoveries are almost certain as drilling continues.

Bangladesh was seeking to attract foreign oil companies with the help of a $26 million program funded mainly by the International Development Association. The project would comprise (1) a 2,400-line-kilometer seismic survey; (2) a hydrocarbon-habitat study to integrate seismic, geologic, and geochemical data into a promotional package for the oil industry; and (3) technical assistance, training, and laboratory equipment to strengthen Bangladesh Oil and Gas Corp. (Petrobangla), the Government oil company, in the technical, financial, and legal fields. Bids have been received from 21 companies on the seismic surveys and related studies.

Another seismic survey will be conducted along the Hinge Zone, a narrow stretch of land running from northeast to southwest Bangladesh. This will be funded with aid from European countries.[5]

Bangladesh Shell Petroleum Co., the only foreign oil company active in Bangladesh, planned to begin drilling its first wildcat in April 1984 in the southeast Chittagong Hill tracts near Burma. Its recent seismic survey there had identified at least two struc-

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tures for potential drilling. Bangladesh Shell is a subsidiary of the Royal Dutch/Shell Group.

The Government will reportedly open 11 exploration blocks to foreign oil companies under production-sharing contracts if the various surveys show promise of commercial oil discoveries. Both onshore and offshore acreages covering almost the entire country will be included.

Exploration and development drilling continued in 1983 by Petrobangla. The Kailashtilla Gasfield, just south of Sylhet, began commercial production on June 27, making it the fifth active gasfield in the country. Initial production was from one well at a rate of 30 million cubic feet per day. Eight other gasfields have been identified in the eastern area. At yearend, Petrobangla announced that its drilling at Sitakund near Chittagong had identified its 14th commercial gasfield. It had been hoped that drilling in this area would find crude oil rather than additional gas.

Despite the relatively large gas reserves, very little gas is actually used considering the large population of the country. Its ratio of gas consumption to proved reserves is one of the lowest of any country. Currently, only about 4% of the population enjoy the benefits of natural gas and electricity. The Government has been trying to develop the gas production and distribution system as fast as finances and customers are available. As consumption increased during the last decade, the consumption pattern has changed as well. The electric power industry used almost 36% of total consumption in 1972 and 34% in 1982. The fertilizer industry dropped from 56% to 42% in that period. Industrial use doubled to 14% by 1982. The biggest change came in the commercial and domestic sectors, which increased their proportions seven times, from 0.4% to 2.8% and from 1% to 7%, respectively.

A major increase in consumption will occur on completion of the Bakhrabad to Chittagong pipeline, under construction during 1983. This 180-kilometer line has the biggest diameter and is the longest in the country. The pipe diameter is 61 centimeters with a wall thickness of 8.5 millimeters on the main line and 14.3 millimeters near all valve stations and under all the major river crossings. Line construction began in October 1982 and progressed well during 1983 as 4 major river crossings and about 100 streams and fishponds were negotiated. Much of the terrain was rice paddies or outright swamp. All of the pipe received a 114-millimeter concrete jacket for weight and protection. River crossings and areas where soil conditions were particularly unstable required the pipe sections be weighted down with 2-ton concrete saddle blocks.

The construction schedule was maintained during the year and laying of the 61-centimeter main-line section was completed in September. A 37-kilometer ring main around Chittagong was scheduled for completion in December. This consisted of 51- and 41-centimeter segments and was to be the basis of the main distribution system.

At least six industrial consumers were in the process of converting to gas and many commercial and domestic customers will be connected as the distribution network expands. Cost of the main line and ring main construction was put at more than $45 million, but it was estimated that more than $100 million in imported petroleum costs will be saved each year by the lower priced natural gas.[6]

On May 10, the International Development Association of the International Bank for Reconstruction and Development (World Bank) approved a $28.5 million credit for a refinery rehabilitation project and a national energy efficiency study. The $36 miilion project was expected to increase the capacity utilization of Eastern Refineries Ltd.'s Chittagong refinery by 15%. In addition, the newly created Energy Monitoring Unit in the Ministry of Energy and Mineral Resources will prepare a national energy conservation program with the assistance of consultants. Feasibility studies for potential uses of natural gas will also be undertaken.

After years of delay, the Bangladesh Chemical Industries Corp. was reportedly ready in 1983 to award an engineering and procurement contract for a grassroots nitrogen fertilizer complex at Chittagong. Toyo Engineering Corp. of Japan was favored over seven other international contractors. The $25 million contract will cover the license, engineering, procurement services, and supervision of construction. The equipment will be purchased under a separate contract. The plant will be designed to produce 1,000 tons of ammonia per day and 1,700 tons of urea per day. The plant will be one of the major consumers of natural gas supplied by the Bakhrabad-Chittagong pipeline.[7]

Table 1.—Other Areas of the Far East and South Asia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Area and commodity	1979	1980	1981	1982[p]	1983[e]
BANGLADESH[2]					
Cement, hydraulic[3]	322,473	335,964	344,830	326,247	[4]306,688
Clays: Kaolin[3]	[r]7,422	[r]10,442	9,982	5,862	[4]2,269
Gas, natural, marketed[3] [5] million cubic feet	39,265	45,364	49,936	63,717	[4]68,646
Iron and steel: Metal:[3]					
Steel, crude (ingot only)	126,371	137,557	139,343	108,624	[4]47,401
Steel products	200,415	169,327	186,013	172,080	[4]54,552
Nitrogen: N content of ammonia	167,132	139,361	152,493	182,252	160,000
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	473	440	NA	NA	NA
Jet fuel do.	60	18	NA	NA	NA
Kerosine do.	2,529	2,499	NA	NA	NA
Distillate fuel oil do.	1,005	1,168	NA	NA	NA
Residual fuel oil do.	3,380	2,574	NA	NA	NA
Naphtha do.	585	785	NA	NA	NA
Unspecified do.	267	312	NA	NA	NA
Refinery fuel and losses do.	[e]306	287	NA	NA	NA
Total do.	8,605	8,083	9,420	8,853	[4]7,168
Salt, marine[3]	674,074	[r]463,000	276,000	[e]250,000	250,000
Stone: Limestone, industrial[3]	57,646	45,480	38,550	44,592	[4]32,101
BRUNEI[2]					
Gas, natural:					
Gross million cubic feet	[r] [e]370,000	[r]367,000	350,000	343,000	352,000
Marketed do.	[r]330,594	[r]328,072	312,533	306,459	315,000
Natural gas liquids:					
Condensate thousand 42-gallon barrels	4,140	3,780	4,230	[e]4,170	4,630
Natural gasoline do.	680	765	196	[e]190	210
Liquefied petroleum gas do.	209	232	104	[e]100	110
Total do.	5,029	4,777	4,530	[e]4,460	4,950
Petroleum:					
Crude do.	85,410	86,010	60,614	65,693	71,600
Refinery products:					
Gasoline do.	161	178	408	697	700
Distillate fuel oil do.	410	433	276	321	320
Residual fuel oil do.	7	7	1	7	7
Other including refinery fuel and losses do.	[r]368	[r]336	283	213	213
Total do.	[r]946	[r]954	968	1,238	1,240
CHRISTMAS ISLAND[2]					
Phosphate rock, marketable:					
Gross weight thousand tons	1,367	1,713	1,423	1,328	[4]1,094
P_2O_5 content do.	491	602	499	466	[4]384
HONG KONG[2]					
Cement, hydraulic do.	1,279	1,489	1,517	1,436	[4]1,717
Clays: Kaolin	2,841	748	8,216	286	[4]834
Feldspar	742	2,974	194	1,744	[4]5,275
Feldspar sand	--	12,964	3,325	31,114	[4]51,272
Iron and steel: Steel, crude[e]	90,000	90,000	120,000	120,000	120,000
Quartz	2	12	--	--	--
KAMPUCHEA[e] [2]					
Salt	26,500	30,000	[4]24,390	[4]38,100	40,000
NORTH KOREA[e] [2]					
Aluminum metal ingot, primary	10,000	10,000	10,000	10,000	10,000
Barite	110,000	110,000	110,000	110,000	110,000
Cadmium metal, smelter	150	[r]140	[r]130	[r]100	100
Cement, hydraulic thousand tons	8,000	8,000	8,000	8,000	8,000
Coal: Anthracite do.	35,000	36,000	36,000	36,000	36,000
Coke do.	2,800	2,900	3,000	3,000	3,000
Copper:					
Mine output, metal content	15,000	15,000	15,000	15,000	15,000
Metal:					
Smelter, primary and secondary	18,000	18,000	18,000	18,000	18,000
Refined, primary and secondary	22,000	22,000	22,000	22,000	22,000
Fluorspar	40,000	40,000	40,000	40,000	40,000
Gold, mine output, metal content troy ounces	160,000	160,000	160,000	160,000	160,000
Graphite	25,000	25,000	25,000	25,000	25,000

See footnotes at end of table.

Table 1.—Other Areas of the Far East and South Asia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Area and commodity	1979	1980	1981	1982[p]	1983[e]
NORTH KOREA[e] [2] —Continued					
Iron and steel:					
Iron ore and concentrate, marketable:					
Gross weight thousand tons	7,400	8,000	8,000	8,000	8,000
Fe content do.	3,000	3,200	3,200	3,200	3,200
Metal:					
Pig iron do.	2,900	3,000	3,000	3,000	3,000
Ferroalloys, furnace type unspecified do.	110	120	120	120	120
Steel, crude do.	3,400	3,500	3,500	3,500	3,500
Lead:					
Mine output, metal content	[r]120,000	[r]125,000	[r]110,000	[r]95,000	95,000
Metal, primary and secondary	70,000	[r]65,000	[r]65,000	[r]60,000	60,000
Magnesite:					
Crude thousand tons	1,825	1,850	1,900	1,900	1,900
Calcined do.	760	770	800	800	800
Nitrogen: N content of ammonia do.	450	450	450	450	450
Phosphate rock	550,000	550,000	550,000	550,000	550,000
Pyrite and pyrrhotite (including cuprous), gross weight thousand tons	620	620	620	620	620
Salt, all types	560,000	570,000	570,000	570,000	570,000
Silver, mine output, metal content thousand troy ounces	[r]1,500	[r]1,400	[r]1,300	[r]1,300	1,300
Sulfur thousand tons	265	265	265	265	265
Talc, soapstone, pyrophyllite	160,000	170,000	170,000	170,000	170,000
Tungsten, mine output, metal content	[r]3,100	[r]3,100	[r]3,100	[r]3,100	3,100
Zinc:					
Mine output, metal content	[r]135,000	[r]130,000	[r]130,000	[r]120,000	120,000
Metal, primary	120,000	[r]105,000	[r]105,000	[r]90,000	90,000
LAOS[e] [2]					
Gypsum	--	[4]20,000	[4]40,500	[4]60,000	70,000
Salt, rock	18,000	20,000	20,000	[4]8,949	10,000
Tin, mine output, metal content	170	290	200	[4]225	200
MONGOLIA[2]					
Cement, hydraulic thousand tons	183	178	210	350	336
Coal:					
Anthracite and bituminous[e] do.	250	250	250	250	250
Lignite and brown[e] do.	3,864	4,126	4,350	4,980	5,180
Total do.	4,114	4,376	4,600	5,230	5,430
Copper, mine output, metal content	21,700	44,000	71,800	90,000	104,000
Fluorspar, all grades thousand tons	567	604	595	670	700
Gypsum[e] do.	28	30	[r]32	[r]32	32
Lime, hydrated and quicklime[e] do.	46	50	50	60	62
Molybdenum, mine output, metal content[e]	222	487	661	[r]830	960
Petroleum refinery products:[e]					
Kerosine thousand 42-gallon barrels	23	23	23	23	23
Residual fuel oil do.	20	20	20	20	20
Salt[e]	15,000	15,000	15,000	15,000	16,000
NEPAL[6]					
Cement, hydraulic	21,364	30,744	30,574	[e]25,000	[4]45,587
Clays for cement manufacture	4,000	4,000	2,000	[e]2,000	2,000
Coal: Lignite	37,530	3,461	8,174	[e]8,000	[4]8,244
Copper ore:					
Gross weight	--	6	6	6	[4]11
Cu content	--	1	2	2	[4]4
Gem stones:					
Garnet kilograms	4,000	[7]41,295	105,925	NA	[4]23,000
Tourmaline do.	25	NA	13	[e]10	10
Lime, agricultural	10,054	[e]10,000	[e]10,000	[e]10,000	10,000
Magnesite, crude	--	[e]15,000	[e]20,000	[e]20,000	[4]15,016
Salt	7	8	8	[e]10	[4]6
Stone:					
Limestone	62,400	32,400	83,565	[e]80,000	[4]50,422
Marble:					
Chips	66	343	366	[e]400	[4]482
Cut square meters	863	3,083	3,561	[e]4,000	[4]3,208
Craggy cubic meters	799	[e]800	963	[e]1,000	[4]3,530
Talc	325	1,460	71	[e]3,000	[4]15,263
SINGAPORE[2]					
Cement, hydraulic thousand tons	[e]1,350	1,952	2,253	2,695	2,000
Iron and steel: Metal: Steel, crude do.	297	340	[e]350	[e]350	350

See footnotes at end of table.

Table 1.—Other Areas of the Far East and South Asia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Area and commodity	1979	1980	1981	1982[p]	1983[e]
SINGAPORE[2] —Continued					
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	17,664	19,144	21,072	14,562	[4]19,738
Jet fuel do.	31,221	32,914	35,228	28,922	[4]30,690
Kerosine do.	20,322	20,610	27,224	29,144	[4]31,377
Distillate fuel oil do.	62,304	63,321	83,008	91,992	[4]88,258
Residual fuel oil do.	85,705	81,309	99,270	80,902	[4]81,906
Lubricants do.	4,316	4,269	3,740	3,152	[4]3,852
Other do.	35,538	30,453	35,728	44,966	[4]41,663
Refinery fuel and losses do.	6,741	10,404	6,755	11,391	[4]8,536
Total do.	263,811	262,424	312,025	305,031	306,020
Stone: Granite, broken thousand cubic meters	2,507	3,185	4,474	5,947	[4]7,534
Sulfur, byproduct of petroleum	2,900	[r]11,347	378	15,188	[4]3,666
SRI LANKA					
Cement, hydraulic thousand tons	592	571	642	[e]650	[4]506
Clays:					
Ball clay	13,291	11,457	9,234	9,291	[4]11,980
Kaolin	5,870	6,614	7,292	8,206	[4]7,976
Brick and tile clay	[e]90,000	62,518	[e]60,000	[e]60,000	60,000
Clay for cement manufacture	90,988	21,148	39,081	62,591	[4]51,931
Feldspar, crude and ground	3,790	3,955	[e]4,000	2,922	[4]2,609
Gem stones, precious and semiprecious other than diamond value, thousands	$31,919	$42,819	$201	NA	$39,814
Graphite, all grades	9,402	7,794	7,573	8,803	[4]5,528
Iron and steel: Metal: Semimanufactures	[e]30,000	NA	--	--	[4]24,546
Mica, scrap	369	145	182	291	[4]171
Nitrogen: N content of ammonia	--	--	43,100	103,600	[4]62,700
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	782	[e]910	NA	968	[4]806
Jet fuel do.	248	[e]270	NA	908	[4]517
Kerosine do.	1,449	[e]1,600	NA	1,226	[4]1,047
Distillate fuel oil do.	2,410	[e]3,550	NA	4,783	[4]3,703
Residual fuel oil do.	3,563	[e]4,800	NA	4,833	[4]3,235
Other do.	[e]1,100	[e]1,450	NA	[e]1,000	[4]1,252
Refinery fuel and losses[e] do.	387	520	NA	600	600
Total do.	9,939	[e]13,100	NA	14,318	[4]11,160
Phosphate rock	9,063	5,000	15,294	[e]20,000	16,000
Rare-earth metals: Monazite concentrate, gross weight	213	63	60	[4]304	300
Salt	121,443	114,279	104,388	176,437	[4]129,222
Sand, glass	2,370	--	--	--	NA
Stone:					
Limestone thousand tons	1,132	1,261	1,812	1,616	[4]947
Quartz, massive	676	741	[e]800	794	[4]764
Titanium concentrate, gross weight:					
Ilmenite	55,370	33,956	80,011	68,282	[4]81,778
Rutile	14,675	12,789	13,301	7,212	[4]8,093
Zirconium: Zircon concentrate, gross weight	1,510	3,031	3,266	5,789	[4]5,721
VIETNAM[8]					
Cement, hydraulic thousand tons	729	641	545	[e]800	[4]928
Chromium: Chromite[e]	14,000	15,000	15,000	16,000	16,000
Clays: Kaolin[e]	1,200	1,250	1,250	1,000	1,200
Coal: Anthracite thousand tons	5,300	5,300	5,900	5,700	[4]6,019
Gypsum[e]	14,000	15,000	15,000	25,000	25,000
Iron and steel: Metal:[e]					
Steel, ingot thousand tons	110	120	110	120	100
Steel, rolled do.	106	62	65	40	40
Nitrogen: N content of ammonia	(9)	(9)	(9)	(9)	(9)
Phosphate rock:[e]					
Gross weight thousands tons	200	90	110	160	220
P_2O_5 content do.	65	30	36	53	73
Salt do.	[e]525	437	403	650	[4]890
Tin:					
Mine output, metal content	[e]200	370	380	[e]500	550
Metal, smelter	(10)	(10)	(10)	475	520
Zinc:[e]					
Mine output, metal content	6,000	6,500	6,000	6,000	7,000

See footnotes at end of table.

Table 1.—Other Areas of the Far East and South Asia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Area and commodity	1979	1980	1981	1982[p]	1983[e]
VIETNAM[8] —Continued					
Zinc[e] —Continued					
Metal, smelter, primary	5,400	5,500	5,000	5,000	6,000

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Aug. 3, 1984.

[2]In addition to the commodities listed, other crude construction materials such as sand and gravel and other varieties of stone presumably are produced, but available information is inadequate to make reliable estimates of output levels.

[3]Data are for years ending June 30 of that stated.

[4]Reported figure.

[5]Gross production is not reported; the quantity vented, flared, or reinjected is believed to be negligible.

[6]Data are for the Nepalese fiscal year ending mid-July of that stated.

[7]Figure includes both gem- and industrial-grade garnet: 4,295 kilograms of gem quality and 37,000 kilograms of industrial quality.

[8]In addition to the commodities listed, iron ore was mined in the past and pig iron was produced at industrial facilities, but the status of these industries under prevailing conditions is not sufficiently clear to allow formulation of reliable estimates of output levels. Similarly, data on output of crude construction materials are not available, and no basis is available to make reliable estimates of output levels.

[9]Nitrogen (N content of ammonia) production capacity of the country's only known plant is 54,000 tons per year; it is not known at what output level the plant is operating.

[10]Revised to zero.

BRUNEI[8]

At yearend, the Independent Sultanate of Brunei, the 5,765-square-kilometer British-protected state on the northwest coast of the island of Borneo, was slated to technically become fully independent, ending a 96-year period of treaty-established British protection. Unlike a great number of former territories, protectorates, and other elements of former colonial empires that have achieved independence since the end of World War II, Brunei will join the ranks of independent countries with an enviable financial and economic position, this based on its single dominant industry, the production and processing of petroleum and natural gas. This industry, the only significant mineral industry of the sultanate, has completely overshadowed the area's other export cash-earner, agriculture, in which rubber, rice, and pepper are the dominant crops. With 1982 export earnings of nearly $4 billion from oil and natural gas only, the small area registered a per capita annual income of over $22,000 in that year. It should be noted that 1982 was the second year in which petroleum industry output had been restricted by Government decree in order to prolong the economic life of the oilfields and gasfields. This policy of restricting output continued through 1983.

The importance of Brunei's exports of petroleum and natural gas to the Sultanate's trade balance is demonstrated by trade value figures for 1981, the most recent year for which complete results are available. The value of total exports and reexports was $4,066 million, of which petroleum and natural gas accounted for 98.9%, including crude oil, 55.6%; natural gas, 39.5%; and refined oil, 3.8%. Of the remaining 1.1%, other mineral commodities accounted for 0.3% and nonmineral commodities for 0.8%. Total 1981 commodity imports were valued at $596 million, of which mineral commodity imports accounted for 18.3%, including iron and steel, 12.6%. Comparison of total 1981 exports and reexports with total 1981 imports indicates a positive trade balance of $3,470 million.

COMMODITY REVIEW

Natural Gas.—Export shipments of liquefied natural gas apparently edged upward in 1983. Although official Brunei export statistics were not available, import data from Japan, the only recipient of Brunei's liquefied gas, indicated a 1.9% increase over the 1982 level. Japanese receipts of gas from Brunei in recent years have been reported as follows (tonnage figures are actually reported, volume figures in parentheses are estimated): 1979—5,413,650 tons (285,841 million cubic feet); 1980—5,549,543 tons (293,016 million cubic feet); 1981—5,225,696 tons (275,917 million cubic feet); 1982—5,153,554 tons (272,108 million cubic feet); and 1983—5,250,899 tons (277,247 million cubic feet). Gas exports in the liquefied form accounted for about 88% of marketed gas production during 1979-82 inclusive, the remaining 12% presumably being consumed indigenously.

Petroleum.—Available information suggests that there was a modest upturn in crude oil production in 1983, but that the increase remained in line with the announced Government plan to restrict production in an effort to prolong the life of known reserves. The output upturn went counter to the worldwide trend, which was one of a small decline. Brunei Shell Petroleum Co. remained the only significant producer of crude oil as well as natural gas through the year.

CHRISTMAS ISLAND[8]

Tiny Christmas Island ranked 14th among world phosphate rock producers in 1983, accounting for about 0.8% of total world output on the gross weight basis and 0.9% of total world output in terms of P_2O_5 content of product. The phosphate mining operation of Phosphate Mining Co. of Christmas Island remained the only organized mineral industry endeavor on this 135-square-kilometer island, 360 kilometers due south of Java Head, in the Indian Ocean.

Indications that the island's industry was facing increasing difficulty in competing in world markets seem substantiated by the 17.6% decline in output (gross weight basis) on Christmas Island between 1982-83, a trend that was in sharp contrast with the 10.2% increase in total world phosphate rock output (also gross weight basis). Clearly, the deposit development plan for the island's phosphate deposits announced in early 1983, which called for the production of 1.4 million tons of ore annually, was not met. This program provided for output of about 1 million tons of "A" grade rock (about 35% P_2O_5) and 300,000 to 400,000 tons of "B" grade rock (somewhat under 35% P_2O_5) from total reserves of about 14 million tons of each grade.

Table 2.—Christmas Island: Exports of phosphate rock, by destination

(Thousand metric tons)

Destination	1981	1982	1983
Australia	735	780	536
China	--	--	21
Indonesia	--	2	6
Korea, Republic of	--	16	31
Malaysia	127	143	165
New Zealand	480	426	302
Singapore	18	--	--
Taiwan	--	--	5
Total	1,360	1,367	1,066

HONG KONG[9]

Mining is insignificant to Hong Kong's economy with output of only small quantities of kaolin and feldspar from mines in the New Territories. At the end of 1983, there were one mining lease and four mining licenses for feldspar and kaolin.[10] Small amounts of iron and steel manufactures are produced from imported scrap, pig iron, and related materials. During the year, China Cement Co. brought on-stream its new preheater-precalcine dry-process plant, which has a production capacity of 1.6 million tons of clinker and 2.75 tons of cement per year.

Light industry—textiles and clothing, electronic watches and clocks, and plastics—dominated Hong Kong's economy. All sectors are export oriented. Total merchandise trade was $49.4 billion: Imports, $25.8 billion; domestic exports, $15.3 billion; and reexports, $8.3 billion.[11] The principal mineral-related imports were fuels, lubricants, and related materials valued at $1.7 billion, or about 7% of total imports. China and Japan were the principal suppliers of imports, providing 24% and 23%, respectively, of total receipts. The largest market for domestic exports was the United States, accounting for 42% of total shipments, followed by the United Kingdom and the Federal Republic of Germany with 8% each, and China, 6%.

Table 3.—Hong Kong: Exports and reexports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	11,538	8,120	--	Taiwan 5,000; Republic of Korea 2,220.
Oxides and hydroxides	2,242	3,115	--	Indonesia 3,000; Vietnam 105.
Metal including alloys:				
Scrap	14,532	16,810	354	Japan 15,451; Taiwan 821.
Unwrought	16,401	48,910	--	Taiwan 15,566; Thailand 8,507; Malaysia 5,947.
Semimanufactures	10,945	13,034	1,462	Taiwan 1,985; Singapore 1,383; China 1,025; Burma 1,012.
Arsenic: Oxides and acids	76	295	--	United Kingdom 140; Taiwan 105; Malaysia 50.
Chromium: Oxides and hydroxides	108	19	--	Indonesia 8; China 5; Vietnam 2.
Cobalt: Oxides and hydroxides	20	13	--	Republic of Korea 4; Taiwan 4; Thailand 2.
Copper: Metal including alloys:				
Scrap	18,289	19,302	32	Japan 14,022; Republic of Korea 2,920; Taiwan 1,234.
Unwrought	120	431	--	North Korea 349; Taiwan 60.
Semimanufactures	1,983	3,204	1	Singapore 635; Taiwan 412; Sri Lanka 243.
Gold:				
Waste and sweepings value, thousands	$5,382	$2,544	$454	Switzerland $1,993.
Metal including alloys, unwrought and partly wrought troy ounces	73,561	828,933	15,156	United Kingdom 582,471; West Germany 190,893.
Iron and steel: Metal:				
Scrap	364,360	296,651	73	Taiwan 179,936; Japan 46,819; Indonesia 34,019.
Pig iron, cast iron, related materials	7,947	7,121	--	Indonesia 6,683.
Ferroalloys:				
Ferromanganese	--	813	--	Indonesia 702; Nigeria 111.
Ferrosilicon	488	1,187	--	Indonesia 827; Republic of Korea 150; Nigeria 110.
Unspecified	1,150	200	--	All to Nigeria.
Steel, primary forms	9,800	3,986	--	All to Philippines.
Semimanufactures	110,160	128,920	254	China 45,807; Macau 23,316; Indonesia 14,722.
Lead:				
Oxides	132	51	--	China 28; Malaysia 13.
Metal including alloys:				
Scrap	2,522	2,291	--	Taiwan 2,140.
Unwrought	490	208	--	Indonesia 85; Taiwan 54; Singapore 50.
Semimanufactures	40	22	--	China 10; Malaysia 6.
Magnesium: Metal including alloys, all forms	21	116	61	Japan 38; North Korea 17.
Manganese: Oxides	486	1,145	--	Taiwan 380; Indonesia 357; North Korea 150.
Mercury 76-pound flasks	3,876	777	--	North Korea 290; Australia 211; Japan 146.
Nickel:				
Oxides and hydroxides	180	109	--	Taiwan 38; Japan 32; Republic of Korea 16.
Metal including alloys:				
Scrap	435	487	--	Japan 444.
Unwrought	2,895	2,793	--	Taiwan 1,492; North Korea 601; Republic of Korea 351.
Semimanufactures	219	353	--	Republic of Korea 187; Thailand 84; Taiwan 33.
Platinum-group metals:				
Waste and sweepings value, thousands	$1,514	$1,399	--	West Germany $829; United Kingdom $506.
Metals including alloys, unwrought and partly wrought troy ounces	3,987	6,190	--	Taiwan 5,318; Republic of Korea 477.
Silver:				
Ore and concentrate value, thousands	--	$3	--	All to West Germany.
Waste and sweepings do	$109,661	$24,523	$3,086	United Kingdom $15,599; France $3,273; West Germany $2,512.
Metal including alloys, unwrought and partly wrought thousand troy ounces	1,326	722	--	United Kingdom 495; Taiwan 100; France 69.

See footnotes at end of table.

Table 3.—Hong Kong: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Tin: Metal including alloys:				
Scrap	445	496	427	Taiwan 27.
Unwrought	1,161	1,027	45	Taiwan 255; North Korea 252; Japan 111.
Semimanufactures	847	674	(2)	Taiwan 206; Singapore 178; Philippines 134.
Titanium: Oxides	2,554	1,814	100	Indonesia 822; China 248; India 102.
Tungsten:				
Ore and concentrate	2,197	4,740	--	West Germany 3,483; Sweden 1,106.
Metal including alloys, all forms	[3]18	1	--	Mainly to United Kingdom.
Zinc:				
Oxides	198	434	--	Indonesia 326; Vietnam 52; Burma 32.
Metal including alloys:				
Scrap	--	74	--	Taiwan 54; Japan 16.
Unwrought	[r]3,154	1,954	--	Macau 560; Singapore 307; Indonesia 258; Philippines 234.
Semimanufactures	17	17	--	China 15.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	177	227	--	Taiwan 95; Republic of Korea 76; Philippines 30.
Artificial: Corundum	888	3,095	--	Republic of Korea 2,055; Taiwan 882.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$78	$17	$2	Taiwan $8; Japan $6.
Asbestos, crude	3,127	1,141	--	Indonesia 975; Singapore 150.
Barite and and witherite	192	759	--	Taiwan 527; Indonesia 215.
Boron materials: Oxides and acids	933	982	--	Taiwan 335; Republic of Korea 318; Philippines 275.
Cement	24,293	73,846	--	China 58,209; Macau 12,427.
Clays, crude:				
Kaolin	9,983	9,936	--	Indonesia 5,780; Taiwan 3,819; China 333.
Unspecified	67,970	71,586	--	Taiwan 57,640; Republic of Korea 9,630; Indonesia 3,478.
Diamond:				
Gem, not set or strung carats	431,224	507,938	47,956	Belgium-Luxembourg 94,438; Israel 84,824; Singapore 75,444.
Industrial do	12,986	186,296	74,181	China 55,527; Japan 45,077.
Diatomite and other infusorial earth	35	44	--	India 33; China 11.
Feldspar and fluorspar	11,318	11,664	--	Taiwan 6,132; Indonesia 5,512.
Fertilizer materials: Manufactured:				
Nitrogenous	6,520	4,978	--	China 2,945; Vietnam 1,700.
Unspecified and mixed	[r]4,021	3,988	11	China 3,907.
Graphite, natural	278	188	--	Taiwan 128; Japan 50.
Gypsum and plaster	1,172	2,185	--	Indonesia 2,032.
Magnesite	8,660	10,937	--	Taiwan 10,115; Indonesia 551.
Pigments, mineral:				
Natural, crude	400	512	--	Indonesia 445.
Iron oxides and hydroxides, processed	1,061	923	--	Indonesia 743; China 95.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$141,429	$114,202	$33,877	Japan $30,437; Singapore $19,690; India $6,277.
Synthetic do	$2,530	$1,319	$337	Switzerland $312; Republic of Korea $220; Singapore $120.
Salt and brine	357	2,955	1	Philippines 2,500; China 237; Papua New Guinea 132.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	[r]3,345	1,555	--	China 1,315; Macau 150.
Sulfate, manufactured	1,613	1,971	--	Indonesia 1,180; Philippines 306; Vietnam 300.
Sulfur: Sulfuric acid	41	225	--	Vietnam 110; China 104.
Talc, steatite, soapstone, pyrophyllite	7,663	11,852	--	Indonesia 9,311; Taiwan 2,218.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	4	--	All to China.
Carbon: Carbon black	786	771	--	Indonesia 389; Philippines 111; Burma 91.
Coal: All grades including briquets	4	22	--	China 18.
Coke and semicoke	546	3,610	--	Indonesia 3,520.

See footnotes at end of table.

Table 3.—Hong Kong: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	33	49	--	Macau 42.
Gasoline do.	82	102	--	Macau 100.
Mineral jelly and wax do.	56	87	--	Philippines 27; Singapore 15; Republic of South Africa 10.
Kerosine and jet fuel do.	83	111	--	Singapore 89; Macau 20.
Distillate fuel oil do.	359	403	--	Singapore 181; Macau 157.
Lubricants do.	225	180	([2])	Indonesia 68; Taiwan 46; China 17.
Residual fuel oil do.	738	870	--	Macau 533; China 297.

[r] Revised.
[1] Table prepared by Audrey D. Wilkes.
[2] Less than 1/2 unit.
[3] Excludes quantity of tungsten articles valued at $780,655.

Table 4.—Hong Kong: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	11,602	10,172	--	China 10,154.
Oxides and hydroxides	2,227	3,848	35	China 3,500; Japan 216; West Germany 94.
Metal including alloys:				
Scrap	580	672	94	Macau 194; China 144; Taiwan 79.
Unwrought	38,020	72,204	831	Canada 41,114; Malaysia 13,385; New Zealand 5,564.
Semimanufactures	23,265	22,809	1,151	Japan 5,779; Australia 4,888; China 4,679.
Arsenic: Oxides and acids	74	157	--	All from China.
Chromium:				
Ore and concentrate	5	5	--	All from Italy.
Oxides and hydroxides	431	435	35	West Germany 189; China 84; United Kingdom 82.
Cobalt: Oxides and hydroxides	42	26	--	United Kingdom 13; China 8.
Columbium and tantalum: Metal including alloys, all forms, tantalum	43	--		
Copper:				
Oxides and hydroxides	243	210	--	West Germany 112; United Kingdom 72; China 24.
Sulfate	282	187	15	United Kingdom 109; China 39.
Metal including alloys:				
Scrap	1,202	2,010	--	Vietnam 1,333; China 240.
Unwrought	1,078	1,093	115	China 552; Republic of South Africa 174.
Semimanufactures	39,432	47,248	1,038	Japan 27,874; China 7,260; France 1,845.
Gold:				
Waste and sweepings value, thousands	$6,638	$4,843	$106	Papua New Guinea $4,081; Singapore $309.
Metal including alloys, unwrought and partly wrought thousand troy ounces	3,258	3,936	8	United Kingdom 2,327; Switzerland 783; Philippines 312.
Iron and steel: Metal:				
Scrap	94,436	64,112	36	China 38,942; Japan 14,583; Macau 5,376.
Pig iron, cast iron, related materials	23,217	12,755	112	China 11,689.

See footnotes at end of table.

Table 4.—Hong Kong: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Iron and steel: Metal —Continued				
Ferroalloys:				
Ferromanganese	511	1,976	--	China 1,313; Australia 400.
Ferrosilicon	854	1,750	--	China 1,586; Republic of South Africa 105.
Unspecified	2,180	1,864	10	Republic of South Africa 826; Australia 400.
Steel, primary forms	127,018	91,326	7	Australia 74,947; United Kingdom 14,416.
Semimanufactures[2]	569,222	552,796	12,852	Japan 257,798; China 71,871; Republic of South Africa 41,519.
Lead:				
Oxides	215	188	--	West Germany 93; China 44; Australia 28.
Metal including alloys:				
Scrap	377	205	--	Australia 106; China 50; Oceania 37.
Unwrought	1,460	2,336	--	North Korea 1,735; Canada 407.
Semimanufactures	205	167	--	Republic of South Africa 53; Belgium-Luxembourg 42; Japan 32.
Magnesium: Metal including alloys, unwrought	67	78	--	Norway 55; China 20.
Manganese: Oxides	1,857	2,053	(3)	China 1,629; Singapore 185; Japan 180.
Mercury 76-pound flasks	2,870	2,033	9	China 1,910.
Nickel:				
Oxides and hydroxides	198	100	--	Canada 50; Netherlands 20; China 19.
Metal including alloys:				
Unwrought	4,534	3,312	1	Canada 2,706; Republic of South Africa 182; Finland 177.
Semimanufactures	575	400	6	Canada 170; Japan 129; West Germany 27.
Platinum-group metals:				
Waste and sweepings value	$27,045	$137,938	--	All from United Kingdom.
Metals including alloys, unwrought and partly wrought troy ounces	78,705	72,779	2,912	United Kingdom 31,919; West Germany 17,957; Switzerland 14,930.
Silver:				
Waste and sweepings value, thousands	$194	$375	$2	Taiwan $206; Japan $77; Philippines $46.
Metal including alloys, unwrought and partly wrought thousand troy ounces	492	772	29	Australia 171; West Germany 131; United Kingdom 113.
Tin:				
Ore and concentrate	--	10	--	All from China.
Metal including alloys:				
Scrap	14	6	--	Do.
Unwrought	1,769	1,451	25	Malaysia 477; China 442; Singapore 255.
Semimanufactures	422	553	18	China 416; Singapore 47.
Titanium: Oxides	6,246	5,103	634	Japan 1,265; Australia 1,164; China 562.
Tungsten: Ore and concentrate	4,185	2,254	--	Macau 1,604; China 650.
Zinc:				
Oxides	710	761	13	China 419; West Germany 123; France 105.
Metal including alloys:				
Scrap	19	39	--	Macau 38.
Unwrought	35,593	22,983	87	Australia 12,068; China 2,750; Belgium-Luxembourg 2,686.
Semimanufactures	492	352	3	West Germany 144; Japan 84; Belgium-Luxembourg 69.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1,610	2,841	317	Japan 1,697; China 457; Italy 221.
Artificial: Corundum	1,263	3,243	30	China 2,891; Japan 283.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$328	$88	$2	Japan $51; United Kingdom $17; Belgium-Luxembourg $14.
Grinding and polishing wheels and stones	2,326	2,340	61	China 1,291; Japan 614; Taiwan 166.
Asbestos, crude	3,297	1,336	35	China 1,272.
Barite and witherite	915	1,173	--	China 914; United Kingdom 144.
Boron materials: Oxides and acids	731	743	170	China 412; U.S.S.R. 160.
Cement thousand tons	3,383	3,355	(3)	Japan 1,320; Taiwan 829; China 599.

See footnotes at end of table.

Table 4.—Hong Kong: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Clays, crude:				
Kaolin	28,500	25,336	--	China 19,359; Japan 5,121; Macau 500.
Unspecified	54,731	78,674	1,882	China 53,467; Macau 14,972; Japan 2,784.
Cryolite and chiolite	60	17	--	All from China.
Diamond:				
Gem, not set or strung thousand carats	1,203	1,442	87	India 540; Israel 281; Belgium-Luxembourg 252.
Industrial do.	9	127	31	China 30; Japan 29; United Kingdom 22.
Diatomite and other infusorial earth	481	427	421	Singapore 3.
Feldspar and fluorspar	14,777	14,440	--	All from China.
Fertilizer materials: Manufactured:				
Nitrogenous	13,472	10,522	90	Japan 3,429; West Germany 2,557; Republic of Korea 1,783.
Unspecified and mixed	10,275	12,705	179	West Germany 10,157; Netherlands 876; Malaysia 532.
Graphite, natural	640	548	--	China 481; Sri Lanka 50.
Gypsum and plaster	71,441	104,289	91	Japan 52,255; Australia 27,359; Thailand 12,133.
Magnesium compounds:				
Magnesite	10,478	15,836	--	China 15,161; Japan 675.
Oxides and hydroxides	852	1,990	--	China 980; Japan 942.
Mica:				
Crude including splittings and waste	33	42	--	Republic of South Africa 31; India 9.
Worked including agglomerated splittings	624	509	1	Japan 427; Belgium-Luxembourg 56.
Pigments, mineral:				
Natural, crude	417	438	--	China 431.
Iron oxides and hydroxides, processed	2,426	1,870	154	Japan 703; China 643; West Germany 277.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$103,575	$23,633	$2,713	Singapore $13,138; Pakistan $1,482; West Germany $830.
Synthetic do.	$5,715	$3,343	$507	West Germany $1,345; Japan $742; Republic of Korea $405.
Salt and brine	71,234	79,955	50	China 71,317; Israel 5,269; West Germany 2,383.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	22,397	23,359	(3)	East Germany 9,602; France 3,780; Kenya 3,090.
Sulfate, manufactured	7,673	11,385	60	China 10,070; Taiwan 998; Japan 128.
Sulfur:				
Elemental: Crude including native and byproduct	1,218	1,189	2	China 540; Japan 424; West Germany 162.
Sulfuric acid	3,167	8,425	31	Japan 4,724; China 3,439.
Talc, steatite, soapstone, pyrophyllite	9,607	12,807	281	China 12,128; Norway 213.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	209	68	33	West Germany 30.
Carbon: Carbon black	1,290	1,236	56	China 906; Japan 84; West Germany 47.
Coal: All grades including briquets thousand tons	57	1,455	--	Republic of South Africa 474; China 427; Australia 403.
Coke and semicoke	4,281	6,130	--	China 3,500; Japan 1,820; Taiwan 750.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	1,355	1,520	(3)	Singapore 966; Japan 452.
Gasoline do.	2,242	2,142	(3)	Singapore 1,159; China 440; Bahrain 393.
Naphtha do.	833	899	2	Singapore 897.
Mineral jelly and wax do.	110	123	3	China 110.
Kerosine and jet fuel do.	7,496	7,563	(3)	Singapore 4,195; China 2,027; Bahrain 841.
Distillate fuel oil do.	[r]8,370	10,096	128	China 5,654; Singapore 2,805; Bahrain 959.
Lubricants do.	485	415	43	Singapore 136; China 93; Australia 65.
Residual fuel oil do.	29,013	27,195	475	Singapore 24,225; China 1,177; Bahrain 742.
Bitumen and other residues do.	[r]174	226	--	Singapore 136; China 71; Japan 9.

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[r] Revised.

[1] Table prepared by Audrey D. Wilkes.

[2] Excludes unreported quantity valued at $2,054,364 in 1981 and $803,559 in 1982.

[3] Less than 1/2 unit.

KAMPUCHEA[12]

Only salt, phosphate rock, and a few gem stones were known to have been produced during 1983. Nonmetallic construction materials were assumed to have been produced locally for consumption in the immediate area of production. None of the mineral production had any significant bearing on the Kampuchean economy, but the salt was distributed nationally for human consumption and as a food preservative.

Two small unsophisticated phosphate fertilizer plants are known to exist but had been idle for several years. During 1983, however, the plant in Battambang Province was returned to operation. The plant uses local phosphate rock, which can be only crushed, roasted, and ground. Although crude, the product probably serves as an effective source of phosphorus, particularly on perennial crops.

A few thousand carats of gem stones were exported in 1981, but the area of gem production that was near the Thai border has been the site of military activity during the succeeding years, and the status of gem mining operations was unknown.

The economy of the country continued to be based almost entirely on agriculture. Rice, maize, and soybeans were the mainstays. Rubber, timber, and tobacco comprised almost all of the remaining commercial crops. Only the simplest of light industry, such as tire recapping, beer, wine, and soft drink factories, paper, and small textile plants, operated in the country. Even these modest economic operations represented a considerable improvement since 1979 when no organized industry operated, and the population survived on subsistence agriculture and foreign aid provided food.

Electricity has been restored to several Provinces, and the capital of Phnom Penh has several hours of electricity per day on a fairly reliable basis. It was planned that the total national power capacity would reach 35,000 kilowatts by the end of 1984. Current capacity of about 10,000 kilowatts was one of the lower per capita power ratings in the world.

NORTH KOREA[13]

The Pyongyang news agency reported that North Korea's state revenue grew at a 10.5% average annual rate during the first 5 years of the current 7-year economic plan (1978-84). In 1983, state revenue grew by 7.5% to 24,383.6 million won (estimated to be about $11.3 billion), compared to expenditures of 24,018.6 million won (estimated to be about $16.0 billion).

The Government targeted industrial development at Anju, Chongjin, Hamhung, Nampo, and Sunchon to strengthen the national economy. The Anju area was promoted as a coal mine base. The coal mines at Chilli, Samchonpo, and Yongnin were under construction for expansion. New coal mines were being constructed at Changdong, Soho, Sosa, and Yonpung. Output of steel in the Chongjin area was being increased to 6 million tons per year; the iron ore mine at Musan was also under expansion. The Hamhung area is the nonferrous metal base. The mines at Choonam, Kamdok, and Sinpa produce 80% of the country's lead and zinc and 70% of the copper. Mine development was being extended to Tanchon and Yanggang. Construction of a third separation plant at Kamdok was completed, expanding lead-zinc concentrate capacity by 150,000 tons per year. The Nampo area featured the construction of a major river lock gate project as well as the expansion of the Kangsan steel complex to 3 million tons per year. And lastly, Sunchon was being developed for chemicals.

Table 5.—North Korea: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Principal destinations, 1982
METALS			
Aluminum: Metal including alloys, semimanufactures	NA	1	Mainly to Singapore.
Cadmium: Metal including alloys, all forms	52	30	All to West Germany.
Copper: Metal including alloys:			
Scrap	72	NA	
Semimanufactures	18	2	All to Indonesia.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	70,176	273,966	West Germany 271,641; Japan 1,990.
Iron and steel: Metal:			
Scrap	7,407	13,227	Japan 8,791; Indonesia 4,436.
Pig iron, cast iron, related materials	75,892	50,899	All to Japan.
Ferrosilicon	2,636	2,790	All to U.S.S.R.
Steel, primary forms	24,991	30,642	Thailand 21,487; Singapore 8,540.
Semimanufactures:			
Bars, rods, angles, shapes, sections	3,023	111	Indonesia 97; Malaysia 14.
Universals, plates, sheets	7,910	22,043	Singapore 8,865; Hong Kong 5,826; Indonesia 5,480.
Hoop and strip	1,500	40	All to Indonesia.
Wire	294	86	Singapore 56; Indonesia 30.
Tubes, pipes, fittings	297	122	Hungary 94; Singapore 26.
Castings and forgings, rough	NA	1	All to Indonesia.
Lead:			
Ore and concentrate	NA	107	All to France.
Oxides	11	NA	
Metal including alloys:			
Unwrought	12,284	22,815	Japan 10,719; West Germany 10,361.
Semimanufactures	297	NA	
Molybdenum: Ore and concentrate	[2]2	NA	
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$19,952	$28,285	West Germany $26,959.
Titanium: Ore and concentrate	1	NA	
Zinc:			
Ore and concentrate	63,985	60,165	Japan 46,886; Yugoslavia 13,279.
Metal including alloys, unwrought	22,090	29,345	Japan 26,848; Hong Kong 1,876.
Other:			
Ores and concentrates	10	3	All to Japan.
Ashes and residues	1,066	3,098	Do.
NONMETALS			
Cement	328,048	69,226	Egypt 39,800; U.S.S.R. 20,926.
Clays, crude	NA	8,368	All to Japan.
Diamond: Gem, not set or strung value, thousands	$10	$44	France $42.
Fertilizer materials: Manufactured:			
Nitrogenous	35,608	3,918	Japan 3,642.
Phosphatic	2,000	3,465	All to Fiji.
Potassic	5,000	2,000	Do.
Graphite, natural	6,055	7,031	Japan 5,970; Austria 1,061.
Magnesium compounds:			
Magnesite	612,824	128,972	Japan 89,174; West Germany 27,990.
Other	79,710	491,719	All to U.S.S.R.
Mica: Worked including agglomerated splittings	3	22	All to Indonesia.
Precious and semiprecious stones other than diamond: Natural value, thousands	$11	$16	All to Italy.
Stone, sand and gravel:			
Dimension stone: Crude and partly worked	7,984	NA	
Gravel and crushed rock	205	220	All to Japan.
Quartz and quartzite	1,644	1,634	Do.
Sulfur: Elemental: Crude including native and byproduct	250	119	All to Indonesia.
Talc, steatite, soapstone, pyrophyllite	30,304	35,270	All to Japan.
Other:			
Crude	50	604	Do.
Slag and dross, not metal-bearing value, thousands	NA	$1	Do.
MINERAL FUELS AND RELATED MATERIALS			
Carbon: Carbon black	90	49	All to Indonesia.
Coal: Anthracite	125,589	40,450	All to Japan.
Petroleum refinery products:			
Kerosine and jet fuel 42-gallon barrels	NA	16,000	Do.
Distillate fuel oil do	NA	29,997	All to Singapore.
Lubricants do	1,260	NA	

[p] Preliminary. NA Not available.

[1] Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by North Korea, this table should not be taken as a complete presentation of this country's mineral trade. These data have been compiled from United Nations information and data published by the partner trade countries.

[2] Excludes imports by Sweden valued at $80,000.

Table 6.—North Korea: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Principal sources, 1982
METALS			
Aluminum:			
Oxides and hydroxides	10	NA	
Metal including alloys:			
Unwrought	252	3,647	Hong Kong 3,347.
Semimanufactures	4,711	982	Japan 696; France 109.
Chromium:			
Ore and concentrate	14,000	16,000	All from U.S.S.R.
Oxides and hydroxides	150	51	All from Japan.
Cobalt: Oxides and hydroxides	1	(2)	Do.
Columbium and tantalum: Metal including alloys, all forms, tantalum kilograms	516	343	Do.
Copper:			
Ore and concentrate	6,298	13,517	All from Philippines.
Metal including alloys:			
Scrap	243	1,197	All from Japan.
Unwrought	NA	349	All from Hong Kong.
Semimanufactures	73	49	Japan 32; Switzerland 14.
Germanium: Metal including alloys, all forms kilograms	NA	200	All from West Germany.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	NA	3,576	Philippines 3,473.
Iron and steel: Metal:			
Scrap	NA	1,559	Japan 1,546.
Pig iron, cast iron, related materials	153	NA	
Ferroalloys:			
Ferromanganese	16,549	13,892	All from Japan.
Unspecified	2,079	2,983	Japan 2,692.
Steel, primary forms	376	NA	
Semimanufactures:			
Bars, rods, angles, shapes, sections	17,260	11,379	Italy 7,968; Japan 3,276
Universals, plates, sheets	[3]18,280	9,282	Japan 7,165; Hong Kong 1,302.
Hoop and strip	315	120	Japan 115.
Rails and accessories	3,965	1,438	All from Japan.
Wire	[3]559	310	Japan 308.
Tubes, pipes, fittings	[4]10,205	6,497	Japan 6,430.
Lead:			
Ore and concentrate	2,023	4,807	All from Japan.
Oxides	NA	2	Do.
Metal including alloys:			
Unwrought	NA	1,947	Do.
Semimanufactures	NA	1	Do.
Magnesium: Metal including alloys, all forms	2	59	Japan 40; Hong Kong 17.
Manganese:			
Ore and concentrate	15,000	28,193	U.S.S.R. 28,000.
Oxides	NA	1,755	Japan 1,345.
Mercury 76-pound flasks	NA	2,040	Singapore 1,450; Japan 300.
Molybdenum: Metal including alloys, all forms kilograms	350	6	All from Japan.
Nickel: Metal including alloys:			
Unwrought	377	601	All from Hong Kong.
Semimanufactures	1	3	All from Japan.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	NA	737	Do.
Silver:			
Ore and concentrate value, thousands	$539	NA	
Metal including alloys, unwrought and partly wrought do	NA	$111	Japan $66; West Germany $45.
Tin:			
Oxides	1	(2)	All from Japan.
Metal including alloys:			
Unwrought	NA	278	Hong Kong 252.
Semimanufactures	NA	1	Mainly from Hong Kong.
Titanium:			
Oxides	144	109	Japan 91.
Metal including alloys, all forms	5	6	All from Japan.
Tungsten:			
Ore and concentrate	NA	105	All from Singapore.
Metal including alloys, all forms	(2)	1	All from Japan.
Zinc:			
Ore and concentrate	[5]9,051	3,880	All from Peru.
Metal including alloys:			
Unwrought	[5]164	NA	
Semimanufactures	NA	160	All from Japan.
Other:			
Oxides and hydroxides	8	14	Singapore 11.
Base metals including alloys, all forms	2	119	Hong Kong 112.
NONMETALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc. value, thousands	$2	NA	
Dust and powder of precious and semiprecious stones excluding diamond do	$15	NA	
Grinding and polishing wheels and stones	24	68	All from Japan.

See footnotes at end of table.

Table 6.—North Korea: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982^p	Principal sources, 1982
NONMETALS —Continued			
Asbestos, crude value, thousands	NA	$3	All from Japan.
Boron materials: Oxides and acids	37	36	All from Italy.
Cement	150	163	France 156.
Clays, crude	5	NA	
Diatomite and other infusorial earth	56	NA	
Fertilizer materials: Manufactured:			
Ammonia	600	NA	
Potassic	81,543	53,239	U.S.S.R. 52,239.
Unspecified and mixed	(2)	NA	
Graphite, natural	NA	47	All from Japan.
Gypsum and plaster	8,760	17,665	Thailand 17,657.
Mica: Crude including splittings and waste	6	1	All from Japan.
Phosphorus, elemental	10	30	Do.
Precious and semiprecious stones other than diamond:			
Natural value, thousands	NA	$2	Do.
Synthetic do	NA	$19	All from Switzerland.
Salt and brine	198	471	All from Japan.
Sodium compounds, n.e.s.:			
Carbonate, natural and manufactured	1	NA	
Sulfate, natural and manufactured	NA	80	All from Japan.
Stone, sand and gravel: Dimension stone, worked	NA	348	Mainly from Italy.
Sulfur:			
Elemental: Crude including native and byproduct	243,164	NA	
Dioxide	2	NA	
Sulfuric acid	NA	4	All from Japan.
Talc, steatite, soapstone, pyrophyllite	NA	7	Do.
Other: Crude	3	3	Do.
MINERAL FUELS AND RELATED MATERIALS			
Carbon: Carbon black	NA	60	Do.
Coke and semicoke	176,417	126,002	Do.
Petroleum refinery products:			
Liquefied petroleum gas 42-gallon barrels	12	81	Mainly from Italy.
Gasoline do	151	NA	
Mineral jelly and wax do	236	5,010	West Germany 2,754; Japan 1,834.
Kerosine and jet fuel do	247	2,254	Hungary 2,069.
Distillate fuel oil do	NA	168,462	All from Singapore.
Lubricants do	2,463	5,531	Japan 2,933; Singapore 2,233.
Bitumen and other residues do	61	NA	
Bituminous mixtures do	1,612	NA	
Unspecified do	1,315	1,320	All from Japan.

^{p}Preliminary. NA Not available.

[1] Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by North Korea, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2] Less than 1/2 unit.

[3] Excludes part of Japanese exports valued at $14,000.

[4] Excludes part of Japanese exports valued at $34,000.

[5] Metallgesellschaft Aktiengesellschaft, Metal Statistics, Frankfurt am Main, West Germany.

LAOS[14]

Laos was an insignificant world producer of mineral commodities during 1983, and the mineral industry contributed modestly to its overall economy. The export of electric power to Thailand was the country's largest foreign exchange earner. Gypsum was being exported to Vietnam in increasingly important amounts. The only metallic mineral produced in commercial quantity was tin in concentrates.

Laos has several known but undeveloped mineral resources. In addition to the gypsum and tin, iron ore, salt, gold, gem stones, potash, and coal occur in potentially commercial quantities.

The major factor preventing development of the mineral industry is the lack of adequate transportation facilities and a paucity of either public or private investment capital.

The Government is considering exploiting some of the more easily developed minerals. Laos and Czechoslovakia signed a contract in January to study the feasibility of exploiting a sapphire mine in Houai Sai District in northern Laos. In November, Lao and Vietnamese mining authorities met to discuss cooperation in mineral development in Laos. Vietnam will help in carrying out feasibility studies of coal mining in southern Saravane Province, potash near Vientiane (city), and silica in I-hai village in Vientiane Province. The potash deposits are a continuation of the extensive bedded potash deposits in Thailand. Development of the potash would take a large capital investment but could have fine export potential to virtually any of the southern or eastern Asian countries, none of which, except China, have domestic production.

Overall, the Lao economy has improved in recent years. The Government appears to have adopted more realistic economic policies. Growth of real gross national product (GNP), adjusted for the high inflation rate, has reportedly averaged about 6.5% during 1979-82. Most of the gains came in the agricultural sector.

It was reported that exports of goods to and through Thailand in FY 1983 totaled $3.6 million, while imports through and from Thailand totaled $72 million.[15] Laos also exported surplus electric power from the Nam Ngum hydroelectric plant reportedly valued at $2 million per month. In addition, both the U.S.S.R. and Vietnam carry on substantial amounts of trade with Laos.

COMMODITY REVIEW

Tin production had been an important source of foreign exchange before the mines were nationalized in 1977. Since then there have been problems with maintenance of the foreign-made equipment. The Soviets have been helping to restore production and modernize the mine and concentration plant equipment at Phontiou. In the first quarter of 1983, only 26% of planned tin production was met because "the first quarter plan... was spent improving the factory."[16] Lao officials plan an eventual production in the range of 800 tons of tin concentrate at the Phontiou facility.

The joint Lao-Vietnamese gypsum mine at Dong Hen in Savannakhet Province continued to operate satisfactorily during the year. The 18,000-ton first-quarter production quota was met, and production continued at approximately that rate through the year. In March, a memorandum was signed between Laos and Vietnam regarding gypsum mining. Since Vietnam was already a partner in the construction and operation of the mine, this new agreement could refer to a previously reported Lao plan to increase production to 200,000 tons per year. The deposit apparently is large enough to sustain the proposed output over a long period. The Lao press has stated that the reserves at Dong Hen are large and that at a production rate of 100,000 tons per year, it would take hundreds of years to mine all the gypsum. Nearly all of the mine's production is exported to Vietnam for use in its expanding cement industry.

The Friendship brick factory was commissioned in Vientiane in June, with officials from both Laos and Vietnam attending the ceremony. Vietnam provided extensive financial and technical aid during the plant's construction. A plant of the same name was reportedly producing at a capacity of 4 million bricks per year in Vientiane at least a year ago. The present capacity was given as 7 million bricks per year. The ceremony probably was for the completion of an extensive modernization and capacity increase rather than for startup of an additional brickworks in the same city.

The country's first mechanized rock quarry and crushing plant was completed in 1982, and full-scale production began early in 1983. Named the Pha Hom Rock Production Co., it is located 7 kilometers from Thakhek in Khammouan Province. The crushing and screening equipment was installed with Soviet aid and can produce 200 cubic meters per day of fully graded or sorted aggregate up to 70 millimeters in size.

The Lao Government has been studying the feasibility of building a small cement plant in the Vang Viang area for several years. Both the U.S.S.R. and Vietnam have been mentioned as potential donors of aid toward the plant. In January, the Lao and Vietnamese Ministries of Construction signed a protocol on the construction of the plant. Capacity of the plant would probably be on the order of 200,000 tons per year.

Laos produced no petroleum or natural gas during 1983 and was totally dependent on imported shipments through Thailand or over rough terrain from Vietnam. To ease the transportation problems and cost involved in importing petroleum products through Thailand, Vietnam has agreed to aid in the construction of a permanent pipeline from Vinh in Nghe Tinh to Vientiane in Laos. The preliminary survey to collect economic and technical data began in June 1981. The detailed engineering survey got off to a slow start in April 1982. During 1983, progress improved and the entire survey was scheduled to be finished late in 1984. Laying of the pipeline will be a major project for the Lao economy and industrial sector. Pipeline capacity will begin wih 170,000 tons per year. This will be stepped up to 220,000 tons per year and finally to 300,000 tons per year. Petroleum storage capacity will also be increased in Laos when the pipeline is completed.

Table 7.—Laos: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Destinations, 1982	
			United States	Other (principal)
Copper: Metal including alloys, scrap	6	138	--	Thailand 106.
Diamond: Gem, not set or strung value, thousands	$449	$83	$83	
Iron and steel: Metal: Scrap	NA	1	--	All to Thailand.
Silver:				
Ore and concentrate value, thousands	$7	NA		
Metal including alloys, unwrought and partly wrought troy ounces	161	NA		
Tin: Ore and concentrate	NA	1,528	--	All to Malaysia.

[p]Preliminary. NA Not available.

[1]Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by Laos, this table should not be taken as a complete presentation of this country's mineral trade. These data have been compiled from United Nations information and data published by the partner trade countries.

Table 8.—Laos: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	3	3	--	Japan 2; Singapore 1.
Copper: Metal including alloys, semimanufactures	1	103	--	United Kingdom 100.
Iron and steel: Metal:				
Pig iron, cast iron, related materials	(2)	NA		
Steel, primary forms	1	NA		
Semimanufactures:				
Bars, rods, angles, shapes, sections	153	1,038	--	Japan 785; France 136.
Universals, plates, sheets	1,352	3,215	--	Japan 1,769; Thailand 1,446.
Hoop and strip	NA	27	--	All from United Kingdom.
Wire	16	712	(3)	Thailand 603; Japan 107.
Tubes, pipes, fittings	355	441	--	Thailand 375; Italy 45.
Castings and forgings, rough	17	(2)	--	All from Japan.
Lead: Metal including alloys:				
Unwrought	4	4	--	Do.
Semimanufactures	12	1	--	All from Thailand.
Zinc: Metal including alloys:				
Unwrought	350	59	--	All from Japan.
Semimanufactures	363	860	--	All from Thailand.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	61	NA		
Grinding and polishing wheels and stones	19	2	--	Japan 1; Thailand 1.
Cement	3,999	12,311	--	Thailand 12,261.
Chalk	135	40	--	All from Thailand.
Clays, crude	50	2	--	Do.
Fertilizer materials:				
Crude, n.e.s	1	NA		
Manufactured:				
Ammonia	33	1	--	Do.
Nitrogenous	2,498	2,056	--	U.S.S.R. 1,181; Thailand 875.
Phosphatic	(2)	NA		
Potassic	20	62	--	All from Thailand.
Unspecified and mixed	87	NA		
Gypsum and plaster kilograms	330	NA		
Mica: Crude including splittings and waste do	3	NA		
Precious and semiprecious stones other than diamond: Natural value, thousands	NA	$52	--	Thailand $41; West Germany $11.
Sodium compounds, n.e.s.:				
Carbonate, natural and manufactured	NA	72	--	All from Italy.
Sulfate, natural and manufactured	107	539	--	All from Thailand.
Stone, sand and gravel:				
Dimension stone: Worked	21	108	--	Do.
Gravel and crushed rock	18	NA		
Limestone other than dimension	22	32	--	Do.

See footnotes at end of table.

Table 8.—Laos: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982^{p}	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Sulfur:				
Elemental: Colloidal, precipitated, sublimed	NA	3	--	All from Thailand.
Sulfuric acid	40	NA		
Other: Crude	NA	50	--	Do.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	12	6	--	Do.
Petroleum refinery products:				
Gasoline 42-gallon barrels	NA	86,606	--	All from Singapore.
Mineral jelly and wax do.	1	67	--	Netherlands 47; Thailand 20.
Kerosine and jet fuel do.	484,590	79,008	--	Singapore 78,964.
Distillate fuel oil do.	NA	99,322	--	All from Singapore.
Lubricants do.	[4]61	1,192	--	Singapore 1,064; Netherlands 63.
Unspecified do.	19	10	--	All from Thailand.

^{p}Preliminary. NA Not available.

[1] Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by Laos, this table should not be taken as a complete presentation of this country's mineral trade. These data have been compiled from United Nations information and data published by the partner trade countries.

[2] Less than 1/2 unit.

[3] Unreported quantity valued at $55,000.

[4] Excludes part of Japanese exports valued at $6,000.

MONGOLIA[17]

Mongolia was the world's largest producer of fluorspar, accounting for 16% of the world mine production in 1983, and remained an important producer of copper and molybdenum in the centrally planned economy countries. Unlike the mineral industries in the Western countries, the Mongolian mineral industry continued to expand with technical and economic assistance from the Soviet Union. The development of the Dzuuntsagaandel and Bor-ondor fluorspar mines was completed by yearend. The fourth-phase construction work of the copper and molybdenum complex at Erdenet reportedly was completed and started to operate at full capacity in October. Other Soviet aid mineral projects still under construction included a new cement and lime complex at Hotol in northern Mongolia, a large coal mine at Baga-Nuur near the Kherulen River, and a major expansion at the Aduuchuluun coal mine near Choybalsan.

As a result of continuing geological expeditions by the Council for Mutual Economic Assistance (CEMA) countries in Mongolia, several mineral deposits reportedly were discovered during the year. These discoveries included a new molybdenum deposit in the Kherulen River basin, and rich deposits of lead, molybdenum, gold, tungsten, fluorspar, and coal in Mongolia's central and eastern regions. A large mica deposit reportedly was discovered by a joint geological expedition of Mongolia and the U.S.S.R. in the Mongolia Altay Mountains of the Podonchin, Ueng, and Bulgun River basins.

According to the Central Statistics Bureau of Mongolia, Mongolian national income grew 5.8% compared with 7.6% in 1982, and gross industrial production increased by 8.1% compared with 10% in 1982. The continuing growth in Mongolian industrial production was attributable to the increase in labor productivity resulting from the high level of capital investment in the past 3 years of the seventh 5-year plan (1981-85). According to the Mongolian State Planning Commission, $3.75 billion[18] was invested in the national economy during 1981-83. Of the $1.3 billion capital invested in 1983, about 72% was for industry and agriculture production. The Mongolian GNP was estimated at $1.7 billion, and the population was estimated at 1.8 million.

The U.S.S.R. remained the major trade partner of Mongolia. The share of the U.S.S.R. in Mongolian foreign trade was about 80%. Mongolia imported over 90% of its requirements in machinery and equipment, 100% of its oil products and semimanufactured steel products, and 50% of its consumer goods from the U.S.S.R. Mongolia exported over 80% of its output of mining and light industries' products to the U.S.S.R. The major export commodities included copper and molybdenum concentrates, fluorspar, tungsten concentrate, carpets, sheepskin, cashmere and camel wool, garments, and knitwear. In 1982, the trade deficit with the U.S.S.R. was estimated at $412 million compared with $367 million in 1981.[19]

COMMODITY REVIEW

Metals.—Production of copper and molybdenum concentrates at the Erdenet Mine continued to increase. The fourth-phase construction work on the ore concentration plant was completed in October. By the end of 1983, the ore concentration plant, capable of processing 16 million tons of ore per year, reportedly was operating at full capacity. The complex of Erdenet consists of an open pit mine, a concentration plant, a mechanical repair plant, a material and technical supply base, a high-capacity thermal powerplant, a 64-kilometer water line from the Selenge River, a 407-kilometer high-voltage electric power line between Darhan and Gusin Lake in the U.S.S.R., a highway between Erdenet and Darhan, a railroad between Erdenet and Salhit, and a town with a population of 50,000. The output of the Erdenet complex accounted for 84.2% of gross production value of the Mongolian mining industry and 30% of the country's export earnings.[20]

Nonmetals.—Mongolia displaced Mexico as the world's largest fluorspar producer. Development of fluorspar mines at Dzuuntsagaandel and Bor-ondor, and construction of a new ore-dressing plant at Bor-ondor reportedly were completed at yearend. To increase labor productivity, additional equipment for sorting fluorspar is planned to be installed in 1984. For the first 6 months of 1983, the output of fluorspar increased 5% from that of the same period in 1982.

The new cement and lime complex was still under construction at Hotol. A railway and a high-voltage power transmission line were also under construction. Mongolia's cement production reportedly dropped 3.6% for the first 9 months of 1983 from that of the same period in 1982, while lime production increased by 3.6%.

Mineral Fuels.—The output of coal increased slightly. On development of the Baga-Nuur deposit, the first stage of 1-million tons per year capacity was completed in 1982. An annual capacity of 2 million tons was planned for 1984, and 6 million tons was projected for 1988. The Baga-Nuur deposit consists of three coalbeds. The average depth of the deposit is 10 to 17 meters. The central section of the deposit is the richest with a depth of 28 to 98 meters. The calorific value of the Baga-Nuur coal is between 28,100 and 29,000 kilojoules per kilogram with 33% moisture, 18% to 20% ash, 0.5% sulfur, and 45% volatile substance. To use the coal for power generation, a large coal-processing plant was being planned. The estimated coal reserves of the area reportedly are adequate for a mine life of 60 to 70 years. The Aduunchuluun coal mine near the city of Choybalsan reportedly was undergoing major expansion to raise the output from 200,000 to 600,000 tons per year by 1985. According to one estimate, Mongolia's known coal reserves are about 16.5 billion tons.[21]

Table 9.—Mongolia: Apparent exports of mineral commodities[1]

(Metric tons)

Commodity	1981	1982[p]	Principal destinations, 1982
Cement	[2]700	9,000	All to U.S.S.R.
Iron and steel: Metal: Scrap	21,400	23,700	Do.
Other: Ashes and residues	52	NA	

[p] Preliminary. NA Not available.

[1] Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by Mongolia, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2] Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

Table 10.—Mongolia: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Principal sources, 1982
METALS			
Copper: Metal including alloys, semimanufactures value, thousands	$8	NA	
Iron and steel: Metal:			
Pig iron, cast iron, related materials	2,200	NA	
Semimanufactures:			
Wire	NA	$6	All from Japan.
Tubes, pipes, fittings	10,100	NA	
Unspecified	48,300	NA	
Tungsten: Metal including alloys, all forms value, thousands	$8	NA	
NONMETALS			
Cement	[2]112,000	65,000	All from U.S.S.R.
Fertilizer materials: Manufactured:			
Nitrogenous	[2]35,900	13,172	Do.
Phosphatic	[2]26,300	45,200	Do.
Salt and brine	2,455	3,060	Do.
Sodium compounds, n.e.s.: Carbonate, natural and manufactured	[2]900	NA	
Stone, sand and gravel: Dimension stone:			
Crude and partly worked	34	NA	
Worked	17	NA	
Sulfur: Sulfuric acid	[2]1,200	1,587	Do.
MINERAL FUELS AND RELATED MATERIALS			
Coal: Anthracite and bituminous	[2]34,400	NA	
Petroleum refinery products:			
Lubricants thousand 42-gallon barrels	[2]154	NA	
Unspecified do.	[2]4,518	NA	

[p] Preliminary. NA Not available.

[1] Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by Mongolia, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2] Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

NEPAL[22]

Mining and quarrying were of little significance to the economy, contributing less than one twenty-fifth of 1% of the GDP in 1981, the latest available figure. Nepal was a predominantly agricultural country in 1983 with 90% to 95% of the population dependent on subsistence farming for their livelihood. Only 1% of the population was employed in the industrial sector.

Mineral developments that are planned for the near term or are underway include zinc and lead mining at Lari in Ganesh Himal, magnesite and talc mining at Kharidhunga, limestone and cement production at Hetauda and Udayapur, and marble at Godavari. Several other minerals are mined by manual methods on a very small scale or are being examined for possible future development.

Mining development was difficult to finance in Nepal because so little cash flow was generated by the agrarian form of lifestyle. Almost any development must rely on outside capital investment or grants or loans of foreign aid.

The Government's draft sixth 5-year plan (1980-85) put forth the following policy outline regarding the mineral sector: (1) to attract private and foreign capital and skill to Nepalese mining development, (2) to increase national capability in analyzing and testing of minerals, (3) to make technical and other services easily available to the private mining sector, and (4) to make existing mining legislation practical and modern.[23]

COMMODITY REVIEW

Work continued at a slow pace on Nepal Metal Co. Ltd.'s lead mining project north of Kathmandu. The Nepalese army was helping with construction of an access road into the mine and concentrator sites. The 105-kilometer road was a major engineering undertaking for Nepal and will be the first motorable road into this part of the country. The alignment chosen was not the shortest to the deposit, but will follow a route through formerly inaccessible mountain terrain where it will better serve the major population in the region. Heavy mining equipment cannot be delivered until the road is completed. Currently, access into the area takes 4 to 6 days by foot or pack animal. The road will open the area to potential development of agriculture, forestry, and tourism.

The deposit lies at an elevation of 4,419 meters and will be entered through an adit into the side of the mountain. Planned output was to be 400 tons of ore per day. The ore will be transported by aerial tramway or slurry pipeline to the concentrator at Somdang, well down the mountainside. Planned annual output will be 18,700 tons of 60% zinc concentrate and 2,600 tons of 60% lead concentrate.

The Chinese-aided Lalitpur brick and tile factory completed a new 5-million-brick-per-year production line and overhauled the old production equipment. New production capacity totaled 19 million bricks and 1 million tiles. The plant had been losing money for 4 years but was expected to have shown a profit this year.

The country's only operating cement plant was being renovated and expanded from 160 to 400 tons per day capacity. The expansion at the Himal Cement Co. plant was expected to be completed within 2 years at a cost of $5 million.[24]

A milestone was reached during 1983 when the first of two 58-meter-high homogenizing silos was topped out on June 30 at the Hetauda Cement Co. construction site. The slip-formed, reinforced concrete cylinder was the tallest manmade structure in Nepal. It was also the first time slip forming was used on any construction project in Nepal.

Construction on the 750-ton-per-day dry-process, rotary kiln plant has been underway since 1978. Published plans call for completion of the plant by yearend 1984, but 1985 would be a more likely date.

Negotiations between Government officials of India and Nepal on the proposed cement plant at Udayapur (also spelled Udaypur and Udaipur) were concluded successfully in June 1983. The plant, which will be Nepal's third and largest, will have a capacity of 1,200 tons per day. Work on the project could begin in 1985 and would cost over $110 million. Demand for cement has risen about 10% per year. The proposed cement plant will utilize limestone and clay from Sindali and Beltar. The plant will be a joint venture by the two Governments. India has further agreed to finance the construction of a road from Jainagar in India to Golebazar on the Mahendra Highway in Nepal to facilitate movement of equipment and materials.

Geological exploration between the Mahakali and Seti Rivers in far western Nepal has revealed stromatolitic phosphorites in the Baitadi carbonate formation. They were located in Bajhang and Baitadi Districts and graded from 10% to 26% P_2O_5 (phosphorus pentoxide) in thicknesses from 1.0 meter to 4.7 meters. This was the first report of phosphorite in Nepal of potential commercial value. Previous reports of phosphorites were limited to grades of only about 5% P_2O_5.

The Government was considering a feasibility study for a urea fertilizer plant. The study would be made with help from the Japanese. Currently Nepal imports all of its fertilizer needs at a considerable burden to the economy.

Progress on the development of the Kharidhunga magnesite mine and processing plant was marked by the offering of an international tender for the major components of the plant. A rather involved financing system was worked out after several false starts and later changes. The International Finance Corp. will provide 25% of the financing, 25% will come from supplier credits from the Indian export-import bank, 20% from Nepalese banks, and 15% equity each will be held by Orissa Industries Private Ltd. of India and His Majesty's Government. Cost of the project was estimated at over $25 million.

Manual mining from high-grade outcrops was producing a small amount of ore. Overburden removal at the Kharidhunga site was continuing. An aerial tramway was chosen as the best way of moving the ore 10 kilometers from the mine to the processing plantsite. The tramway will descend from an elevation of 2,652 meters through rugged terrain to Lamosangu at an elevation of 823 meters.

SINGAPORE[25]

Singapore, a free-market economy, does not have barriers on imports or exports. The GDP in 1983 was $15.3 billion,[26] of which trade accounted for 24%; followed by financial and business services, 22%; transport and communications, 21%; manufacturing, 20%; and other, 13%. Products of the minerals sector included small amounts of iron and steel, which faced keen competition in 1983 because of less expensive imports; about 4,000 tons of tin metal, which was produced from concentrates allegedly smuggled out of neighboring countries; and aggregates for cement. Domestic production of cement supplies about 65% of Singapore's demand for cement.

In terms of type of industrial production, the value-added output of electronic products was $817 million; followed by petroleum refining, $668 million; and machinery, $417 million. In comparison, the value-added output of cement and concrete products was $118 million; other nonmetallic mineral products, $28 million; iron and steel, $53 million; and nonferrous metals, $15 million.[27] Singapore's oil refiners faced increased competition by the completion of two new refineries in Indonesia and expansion of refinery capacity in Thailand. Prospects for Singapore's industry, however, was brightened with a contract to process 20,000 barrels per day of Chinese crude oil for 1 year. In addition, Malaysia postponed the construction of a 120,000-barrel-per-day refinery and was expected to conclude crude oil processing contracts with refineries in Singapore.

Table 11.—Singapore: Exports and reexports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	2,421	691	--	Malaysia 505; Pakistan 176.
Metal including alloys:				
Scrap	6,196	7,450	--	Japan 5,535; Malaysia 397.
Unwrought and semimanufactures	7,440	12,663	NA	Malaysia 8,699; Hong Kong 779; Brunei 653.
Antimony: Metal including alloys, all forms	26	--		
Chromium: Oxides and hydroxides	46	49	--	Malaysia 34; Pakistan 9.
Copper: Metal including alloys:				
Scrap	13,849	15,328	48	India 8,073; Japan 2,906; Republic of Korea 2,106.
Unwrought and semimanufactures	8,475	14,065	9	Malaysia 12,883; India 499.
Iron and steel: Metal:				
Scrap	1,602	7,877	--	India 2,574; Thailand 2,050; Japan 1,945.
Pig iron, cast iron, related materials	^{r}7,863	9,683	--	Malaysia 8,493; Burma 978.
Ferroalloys	1,148	2,119	--	India 1,653; Malaysia 260; North Korea 147.
Steel, primary forms	10,520	3,673	--	Malaysia 3,632.
Semimanufactures	405,973	426,304	6,142	Malaysia 228,173; Brunei 36,447; India 20,054.
Lead:				
Ore and concentrate	5,000	100	--	West Germany 90.
Oxides	227	624	--	Japan 530; Malaysia 76.
Metal including alloys:				
Scrap	3,524	2,812	--	India 945; Japan 119.
Unwrought and semimanufactures	962	1,720	79	Malaysia 705; Thailand 554; Pakistan 242.
Manganese:				
Ore and concentrate, battery-grade	27,203	19,104	--	Republic of Korea 2,916; India 2,825; Philippines 2,677.
Oxides	1,287	2,065	--	Malaysia 1,508; North Korea 260; Thailand 125.
Mercury 76-pound flasks	398	1,450	(2)	Mainly from North Korea.
Nickel: Metal including alloys:				
Scrap	503	533	25	Japan 372.
Unwrought and semimanufactures	1,320	2,830	--	India 2,745.
Silver:				
Waste and sweepings[3] value, thousands	$1,224	$1,087	$189	Japan $655; Australia $121; United Kingdom $97.
Metal including alloys, unwrought and partly wrought do	$3,331	$1,608	$165	Australia $479; Malaysia $373; United Arab Emirates $180.
Tin:				
Ore and concentrate	3,318	4,048	--	U.S.S.R. 2,231; Spain 1,524.
Metal including alloys:				
Scrap	440	186	1	NA.
Unwrought and semimanufactures	16,244	18,751	5,933	Japan 6,131; Netherlands 2,306; Malaysia 809.
Titanium: Oxides	553	685	--	Malaysia 571; Burma 54; Japan 54.

See footnotes at end of table.

Table 11.—Singapore: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS —Continued				
Tungsten:				
Ore and concentrate	971	630	--	West Germany 181; India 143; Republic of Korea 105.
Metal including alloys, all forms	173	72	48	France 9; Italy 8.
Zinc:				
Oxides	1,324	1,068	--	Japan 787; Australia 87; Burma 76.
Metal including alloys:				
Scrap	1,344	886	--	Japan 390; India 55.
Unwrought and semimanufactures	5,005	4,612	--	Malaysia 3,619; Vietnam 145; Philippines 108.
NONMETALS				
Asbestos, crude	11,603	8,940	--	Malaysia 8,769; Burma 144.
Barite and witherite	--	10,204	--	Malaysia 6,041; Australia 1,091; United Arab Emirates 999.
Boron materials:				
Crude natural borates	734	363	--	All to Malaysia.
Oxides and acids	213	139	--	Philippines 60; Australia 36.
Cement	472,667	433,513	--	Malaysia 376,298; Brunei 18,123; Australia 15,897.
Clays, crude	41,995	35,373	--	Malaysia 19,435; Thailand 3,289; Philippines 2,990.
Diamond:				
Gem, not set or strung value, thousands	$7,818	$13,582	$1,223	Hong Kong $9,362; Belgium-Luxembourg $1,138.
Industrial do	$999	$1,307	$349	Australia $247; Saudi Arabia $211; Japan $201.
Feldspar, fluorspar, related materials	656	2,915	--	Malaysia 2,891.
Fertilizer materials: Manufactured:				
Nitrogenous	124,117	347,197	--	China 320,445; Malaysia 23,564.
Phosphatic	3,068	1,904	--	Philippines 787; Malaysia 527; Thailand 400.
Potassic	266,514	190,007	--	China 78,292; Malaysia 56,550; Bangladesh 38,000.
Unspecified and mixed	78,588	79,838	--	Malaysia 76,009; Kampuchea 1,967.
Graphite, natural	124	89	--	Malaysia 87.
Iodine value	$21,300	NA		
Magnesite	333	187	--	Malaysia 97; Republic of Korea 90.
Mica, all forms	351	206	--	Malaysia 80; Philippines 26; China 19.
Phosphates, crude	29,988	23,791	--	Malaysia 20,176.
Pigments, mineral: Iron oxides and hydroxides, processed	844	621	--	Malaysia 584; Burma 20.
Precious and semiprecious stones other than diamond -- value, thousands	$30,444	$15,655	$282	Hong Kong $10,293; Thailand $3,291; Japan $659.
Sodium compounds, n.e.s.: Carbonate, manufactured	8,127	4,620	--	Malaysia 4,542.
Sulfur:				
Elemental:				
Crude including native and byproduct	9,006	12,999	--	Thailand 9,548; Malaysia 3,206.
Colloidal, precipitated, sublimed	20,060	8,126	--	Malaysia 6,693; Philippines 994; Sri Lanka 351.
Sulfuric acid	1,607	690	--	Sri Lanka 304; Malaysia 296; Brunei 53.
Talc, steatite, soapstone, pyrophyllite	1,222	909	--	Malaysia 894.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	7,668	33,310	--	Malaysia 22,064; Burma 3,021; Australia 2,674.
Carbon: Carbon black	351	1,572	--	India 1,110; Malaysia 348.
Coal: All grades including briquets	606	1,157	--	Burma 335; Thailand 314; United Kingdom 129.
Coke and semicoke	7,612	8,004	--	Malaysia 7,520; Sri Lanka 470.
Petroleum:				
Crude thousand 42-gallon barrels	368	2,016	--	Australia 1,442; Malaysia 574.
Refinery products:				
Liquefied petroleum gas do	2,280	2,590	--	Hong Kong 963; Thailand 946; Malaysia 648.
Gasoline do	14,042	14,182	310	Malaysia 6,241; Iran 1,483; Australia 1,298.

See footnotes at end of table.

Table 11.—Singapore: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Naphtha thousand 42-gallon barrels	24,406	NA		
Mineral jelly and wax do	85	488	(2)	Philippines 134; Sweden 126; Malaysia 83.
Kerosine and jet fuel do	24,469	20,577	--	Japan 4,810; Hong Kong 4,141; Malaysia 2,085.
Distillate fuel oil do	37,622	43,961	--	Malaysia 12,045; Thailand 6,008; India 4,732.
Lubricants do	2,666	2,617	50	Malaysia 722; Thailand 516; India 245.
Residual fuel oil do	60,810	63,058	3,149	Hong Kong 24,248; Japan 12,756; Malaysia 9,446.

[r] Revised. NA Not available.
[1] Table prepared by Audrey D. Wilkes.
[2] Less than 1/2 unit.
[3] May include platinum-group metals.

Table 12.—Singapore: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	6,625	10,792	88	Japan 7,419; China 3,094.
Metal including alloys, unwrought and semimanufactures	35,625	38,923	2,898	Japan 5,216; Australia 4,579; Malaysia 4,436.
Antimony: Metal including alloys, all forms	31	--		
Chromium:				
Ore and concentrate	--	35	--	All from Japan.
Oxides and hydroxides	266	221	78	Japan 60; Poland 20; West Germany 19.
Cobalt:				
Oxides and hydroxides	8	7	--	Belgium-Luxembourg 2; Canada 2; United Kingdom 2.
Metal including alloys, unwrought	6	--		
Columbium and tantalum: Ore and concentrate	307	NA		
Copper: Metal including alloys:				
Scrap	4,551	5,090	67	Malaysia 4,453; Brunei 173.
Unwrought and semimanufactures	30,848	36,422	1,264	Japan 21,059; Australia 3,112; United Kingdom 1,404.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	30,876	25,256	--	Malaysia 25,207.
Metal:				
Scrap	78,214	93,027	68,250	Australia 18,215; Malaysia 5,913.
Pig iron, cast iron, related materials	63,040	102,665	189	Australia 51,537; China 49,685; Japan 1,057.
Ferroalloys:				
Ferromanganese	505	3,611	--	Australia 3,214.
Unspecified	9,070	7,275	8	Australia 3,542; New Caledonia 1,474; China 1,012.
Steel, primary forms	43,693	200,821	19,804	New Zealand 47,676; China 30,120; Netherlands 29,971.
Semimanufactures thousand tons	1,954	2,100	29	Japan 1,426; Republic of Korea 99; Belgium-Luxembourg 61.

See footnotes at end of table.

Table 12.—Singapore: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS —Continued				
Lead:				
Ore and concentrate	5,010	123	--	Thailand 90; Morocco 18.
Oxides	612	446	--	Australia 294; West Germany 78; Japan 39.
Metal including alloys:				
Scrap	167	326	--	Malaysia 242; Brunei 66.
Unwrought	3,900	3,163	29	Australia 2,023; China 218; Thailand 213.
Semimanufactures	665	982	12	Australia 504; West Germany 110; Japan 80.
Magnesium: Metal including alloys, all forms	112	54	48	Japan 5.
Manganese:				
Ore and concentrate	80,900	68,209	--	NA.
Oxides	3,103	2,502	2	Japan 1,124; Ireland 1,116; China 124.
Mercury 76-pound flasks	415	2,176	261	China 1,102; Netherlands 754.
Molybdenum:				
Ore and concentrate	30	--		
Metal including alloys, all forms	13	9	1	Philippines 7.
Nickel: Metal including alloys:				
Scrap	135	193	--	Malaysia 126; Philippines 19.
Unwrought and semimanufactures	1,638	1,633	19	New Caledonia 1,322; Canada 71; Norway 60.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$1,016	$884	$128	United Kingdom $184; Australia $60; U.S.S.R. $58.
Silver: Metal including alloys, unwrought and partly wrought do	$4,549	$3,370	$86	Australia $1,375; West Germany $700; United Kingdom $626.
Tin:				
Ore and concentrate	1,996	3,041	--	Thailand 2,036; Burma 866.
Ash and residue containing tin	9,343	NA		
Metal including alloys:				
Scrap	1,503	627	8	Australia 550; Malaysia 52.
Unwrought and semimanufactures	1,838	1,841	13	Hong Kong 318; Japan 296; Malaysia 243.
Titanium: Oxides	4,099	4,636	297	Japan 1,727; Australia 959; West Germany 597.
Tungsten:				
Ore and concentrate	1,925	971	NA	Burma 678; Turkey 60; Australia 56.
Metal including alloys, all forms	89	66	4	China 33; Austria 15; Australia 10.
Zinc:				
Oxides	494	755	5	China 465; France 128; Japan 45.
Metal including alloys:				
Scrap	530	292	--	Malaysia 283.
Unwrought and semimanufactures	18,732	21,730	1,165	Canada 6,920; Australia 3,380; Peru 1,933.
Zirconium: Ore and concentrate	2,081	NA		
NONMETALS				
Abrasives, n.e.s.: Natural: Corundum, emery, pumice, etc	594	859	560	China 200; United Kingdom 51.
Asbestos, crude	16,824	9,767	390	Canada 2,572; Australia 2,300; China 457.
Barite and witherite	29,698	19,494	--	Thailand 10,621; India 5,750; Malaysia 2,851.
Boron materials:				
Crude natural borates	782	323	323	
Oxides and acids	239	440	145	China 175; Italy 108.
Cement thousand tons	1,954	2,685	(2)	Japan 1,638; Republic of Korea 350; Thailand 21.
Chalk	5,003	3,076	--	Thailand 1,170; United Kingdom 975; Malaysia 561.
Clays, crude	92,467	69,026	44,788	Malaysia 5,859; West Germany 4,784; United Kingdom 4,152.
Diamond:				
Gem, not set or strung value, thousands	$45,824	$47,876	$2,534	Israel $15,300; Belgium-Luxembourg $11,594; India $10,041.
Industrial do	$3,509	$3,555	$602	Belgium-Luxembourg $713; Hong Kong $553; Israel $526.
Diatomite and other infusorial earth	555	1,061	817	Japan 110; China 105.
Feldspar, fluorspar, related materials	5,550	6,034	--	China 2,170; India 1,917; Thailand 1,620.

See footnotes at end of table.

Table 12.—Singapore: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials: Manufactured:				
Nitrogenous	142,635	400,276	66,618	U.S.S.R. 253,376; Qatar 40,017; East Germany 14,900.
Phosphatic	48	3,173	2,004	Malaysia 1,161.
Potassic	257,315	261,503	5	Canada 101,714; Israel 80,235; U.S.S.R. 21,545.
Unspecified and mixed	71,192	69,969	110	West Germany 57,151; Finland 8,000; Malaysia 3,878.
Graphite, natural	554	583	16	China 243; Republic of Korea 236; Japan 58.
Gypsum and plaster	83,527	117,306	86	Australia 71,233; Japan 31,383; Thailand 13,143.
Iodine value	$50,173	NA		
Magnesite	431	603	55	China 316; Japan 100; Norway 72.
Mica, all forms	1,275	1,434	257	India 601; China 425.
Phosphates, crude	20,250	27,131	--	Christmas Island 19,201; Israel 5,958; Japan 1,649.
Pigments, mineral: Iron oxides and hydroxides, processed	3,141	2,501	153	West Germany 842; China 662; Japan 641.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$26,784	$25,566	$354	Kenya $16,642; Hong Kong $3,805; Sri Lanka $1,540.
Synthetic do	$226	$265	--	Japan $159; Hong Kong $52; Thailand $39.
Salt and brine	41,477	41,703	160	Thailand 17,020; Australia 12,732; Israel 3,786.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	23,433	14,164	1	Kenya 11,524; East Germany 981; United Kingdom 882.
Sulfate, manufactured	7,116	NA		
Sulfur:				
Elemental:				
Crude including native and byproduct	219	57	--	Poland 20; Republic of Korea 17.
Colloidal, precipitated, sublimed	3,273	262	51	China 100; Poland 75.
Sulfuric acid	193	81	52	West Germany 24.
Talc, steatite, soapstone, pyrophyllite	9,000	7,660	145	China 5,673; Republic of Korea 1,204; Norway 310.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,507	4,345	86	Thailand 950; Japan 488; Republic of Korea 330.
Carbon: Carbon black	7,448	7,062	228	Malaysia 4,283; Japan 1,591; West Germany 318.
Coal: All grades including briquets	3,196	2,483	2,344	Japan 44; Canada 33.
Coke and semicoke	14,338	9,787	41	Japan 8,034; China 304; Hong Kong 100.
Petroleum:				
Crude thousand 42-gallon barrels	234,261	96,975	--	Malaysia 42,091; Iran 28,712; Brunei 6,365.
Refinery products:				
Liquefied petroleum gas do	15	NA		
Gasoline do	1,017	2,205	NA	Bahrain 1,707; Australia 337; Republic of Korea 156.
Naphtha do	2,334	NA		
Mineral jelly and wax do	47	186	11	China 148; Japan 6.
Kerosine and jet fuel do	1,545	3,224	88	Malaysia 1,008; Kuwait 804; Brazil 382.
Distillate fuel oil do	2,128	5,916	576	China 1,943; Bahrain 1,297; Australia 740.
Lubricants do	490	638	34	Australia 263; Netherlands Antilles 206; China 28.
Residual fuel oil do	23,036	48,805	4,938	Kuwait 14,569; Bahrain 9,126; Saudi Arabia 4,066.

NA Not available.

[1] Table prepared by Audrey D. Wilkes.

[2] Less than 1/2 unit.

SRI LANKA[28]

The mining industry has been at a rather low level of activity following the nationalization of most of the mines beginning 15 years ago. Most mining is now by two state-owned companies—Ceylon Mineral Sands Corp. and the State Mining and Mineral Development Corp. (SMMDC). Private-sector mining is mainly gem stones.

SMMDC has the responsibility of operating most of the graphite mines, which were nationalized in 1971. Traditionally, the island has provided very high-quality graphite to the world. SMMDC also operates several mines producing mica, phosphate rock, and other nonmetallics.[29] Mining and quarrying accounted for 3% of real GDP and showed a growth of 4.1% in 1982. Overall real growth for 1983 was 4.9%.

The Geological Survey Department has been improving its capabilities in exploration geology and applied research with the assistance of the Asian Development Bank and foreign consultants. Implementation of the plans will take 5 years and cost $22 million.[30] The overall program will eventually include regional geochemical and geophysical surveys and airborne magnetic, radiometric, and electromagnetic surveys covering appropriate structures of the island. The immediate purpose of the aerial survey was reported to pinpoint target areas for detailed ground followup work on uranium and thorium (radiometric); iron ore (magnetic); and pyrite, chalcopyrite, and graphite (electromagnetic).[31]

Sri Lanka produced and exported several mineral concentrates derived from its heavy mineral sands in 1983. High-grade graphite was produced and exported. Nearly all gem stones except for diamond and emerald were produced in significant quantities. Some were exported rough, but a growing percentage was cut and polished domestically, adding greatly to the value of the gem industry.

Sri Lanka relied entirely on imports for its mineral fuel needs.

COMMODITY REVIEW

Nonmetals.—*Cement.*—Lanka • Cement Corp. Ltd. inaugurated its first kiln early in the year at Kankesanturai. The second unit was scheduled to go into operation before yearend and bring its capacity to 600,000 tons per year. Lanka Cement was formed in 1980 as a public company. It formed a joint venture with the old Ceylon Cement Corp. to establish a new cement plant. It is believed that the Ceylon Cement plant at Kankesanturai will continue to operate. Limestone reserves near the plants are sufficient for many decades of operation. The development of infrastructure and tourism has led to a greatly increased demand for cement, and both companies' outputs will be needed.

Fertilizer Materials.—The start of construction on the 600,000-ton-per-year phosphate fertilizer project awaited final approval of the Sri Lankan Government. When approval is granted, Agrico Chemical Co. of the United States, 49% partner with SMMDC, will make a detailed geologic study to confirm and define the phosphate reserves. The mine, railroad, and fertilizer plant are estimated to cost over $400 million.

Gem Stones.—Gem stone mining has been an important money earner for the country since ancient times. The official value of production and export of precious and semiprecious stones probably exceeded any other mineral commodity in most years. Actual values were considerably higher than official statistics because of illicit export trade.

Traditional primitive, one-person or family-sized diggings still produced most of the stones in 1983. The gems occur in small, virtually random pockets and lens of present and fossil riverbed gravels. A pocket is worked by screening and panning for a few weeks or months until the values no longer pay and then abandoned. A recent attempt at mechanization in areas to be flooded by new reservoirs was not commercially successful and apparently has been terminated.

Graphite.—The plan to modernize the graphite industry with the aid of a Belgian consultant was delayed because of high interest rates and low world demand. The Finance Ministry was expected to grant approval when economic conditions improve. The project will aim at increasing production to nearly 17,000 tons per year in 5 years.

In line with the Government's policy to develop a more open economy, participation in the graphite industry by private individuals was being encouraged. Although no mining was presently being undertaken by organized private industry, family and small mining groups were encouraged to reopen some of the old abandoned workings with technical advice from SMMDC. On a large scale, a plant to process up to 1,200 tons per year of lump material into flake graphite was being set up by a family with a long history in the graphite industry.

Domestic consumption of graphite was only about 200 tons per year. SMMDC was therefore seeking to set up a graphite-based industry in Sri Lanka with the aid of a foreign collaborator. The partner would be expected to supply up to 49% of the investment and contribute technical expertise, machinery, and marketing know-how outside the country. SMMDC would provide raw materials for the test work, power, water drainage, and infrastructure. Four projects were being proposed—cinema carbon arcs and carbon electrodes; carbon brushes for electric motors; colloidal graphite lubricants, greases, and paints; and graphite crucibles for the export market. Graphite crucibles for the domestic market were already produced in a 100-ton-per-year plant owned by Ceylon Ceramic Corp.[32]

Mineral Sands.—Plans have been made to establish a wet magnetic separation plant to produce 150,000 tons per year of ilmenite. The new facility would use lower grade but more extensive beach deposits. It will increase the ilmenite available for the company's planned ilmenite beneficiation operation and provide additional amounts of nonmagnetic tailings for rutile, zircon, and monazite production. The company has also been looking for a foreign collaborator to establish downstream rutile and titanium industries.

Mineral Fuels.—The country produced no domestic mineral fuels and continued to welcome foreign collaboration in its petroleum exploration program. The Indian and Sri Lankan Governments signed an agreement to share geophysical and geologic data in the Gulf of Mannar and Palk Straits. During the year, the Seahawk consortium relinquished block 2. Most of the eastern and southern shore concessions were open at yearend. In April, a seismic option contract was signed between R. J. Walker Oil Group of the United States and the Government covering blocks 5 and 8.[33]

Table 13.—Sri Lanka: Exports and reexports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Iron and steel: Iron ore and concentrate excluding roasted pyrite	9,275	9,250	--	Mainly to Netherlands.
Lead: Metal including alloys, all forms	512	428	--	India 355.
Titanium: Ore and concentrate	32,816	14,144	5,000	Japan 9,144.
NONMETALS				
Fertilizer materials: Manufactured, nitrogenous	(2)	40,855	--	Mainly to Burma.
Graphite, natural	4,350	2,903	680	Japan 577; United Kingdom 510; Australia 298.
Mica: Crude including splittings and waste	1,393	1,007	--	Japan 943; Belgium-Luxembourg 42.
Precious and semiprecious stones other than diamond:				
Natural carats	231,835	964,237	67,529	Singapore 382,781; Japan 99,245; West Germany 98,812.
Synthetic do.	13,568	5,905	3,927	Japan 1,372.
Salt and brine	16,512	24,413	--	Bangladesh 12,763; Tanzania 8,350; Kenya 2,000.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum:				
Partly refined 42-gallon barrels	1,191	1,267	--	All to Maldives.
Refinery products:				
Nonbunker:				
Liquefied petroleum gas do.	58	139	--	Do.
Gasoline do.	1,538	421	--	Do.
Kerosine and jet fuel do.	225,716	1,913	--	Mainly to Maldives.
Distillate fuel oil do.	162,248	135,320	--	Mainly to Yemen (Aden).
Residual fuel oil do.	139,122	11	--	All to Singapore.
Lubricants do.	--	38	--	Singapore 25; Belgium-Luxembourg 13.
Nonlubricating oils do.	820,582	1,372,597	--	Singapore 872,281; Malaysia 500,316.
Bunker:				
Jet fuel do.	813,680	665,720		

See footnotes at end of table.

Table 13.—Sri Lanka: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Bunker —Continued				
Distillate fuel oil 42-gallon barrels	269,291	335,208		
Residual fuel oil do	1,254,597	1,329,915		
Lubricants do	611	4,232		

[1] Table prepared by Audrey D. Wilkes.
[2] Less than 1/2 unit.

Table 14.—Sri Lanka: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	15,485	6,215	1	India 3,463; United Kingdom 800; Hong Kong 564.
Copper: Metal including alloys, all forms	1,363	21,581	11	India 473; Australia 412; Japan 307.
Iron and steel: Metal:				
Ferroalloys	196	26	--	Norway 19; India 7.
Steel, primary forms	24,020	9,008	--	Republic of South Africa 5,998; Zimbabwe 2,999.
Semimanufactures	126,361	91,377	1,213	Japan 38,809; Republic of South Africa 17,650; Singapore 8,134.
Lead: Metal including alloys, all forms	927	957	9	Australia 834.
Manganese:				
Ore and concentrate: Metallurgical-grade	1,147	1,121	--	Singapore 883; United Kingdom 237.
Oxides	416	620	--	Singapore 235; Ireland 168; India 76.
Mercury 76-pound flasks	348	5	(2)	Mainly from Australia.
Molybdenum: Metal including alloys, all forms	12	12	--	Mainly from Switzerland.
Tin: Metal including alloys, all forms	135	108	--	United Kingdom 55; West Germany 49.
Tungsten: Metal including alloys, all forms kilograms	340	134	11	Sweden 77; Netherlands 46.
Zinc:				
Oxides	461	510	--	China 242; United Kingdom 77; West Germany 55.
Blue powder	5	1	--	All from United Kingdom.
Metal including alloys, all forms	380	288	(2)	Japan 210; Australia 70.
NONMETALS				
Asbestos, crude	4,222	2,399	--	Canada 1,424; Australia 334; Uruguay 250.
Cement	41,864	142,971	5	Japan 128,067; Kenya 7,000.
Clays, crude	6,106	4,211	4	Thailand 2,500; United Kingdom 903; Japan 353.
Diamond:				
Gem, not set or strung value, thousands	[r]$392	$10,757	--	Belgium-Luxembourg $8,938; United Kingdom $963.
Industrial value	[r]$13,621	$149	--	All from United Kingdom.
Fertilizer materials:				
Crude, n.e.s	13,301	17,773	--	Egypt 14,457; Jordan 3,300.
Manufactured:				
Ammonia	99	137	--	United Kingdom 62; Netherlands 40; Japan 20.
Nitrogenous	147,415	36,496	25	Japan 30,506; Saudi Arabia 5,000.
Phosphatic	22,921	22,500	1,500	Turkey 10,500; Sierra Leone 10,000.
Potassic	72,395	70,758	--	Canada 30,000; West Germany 16,205; U.S.S.R. 10,038.
Unspecified and mixed	39,516	16,756	31	Japan 16,000.

See footnotes at end of table.

Table 14.—Sri Lanka: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Gypsum and plaster	16,043	2,630	--	India 1,976; West Germany 440.
Magnesite	432	27	--	All from Japan.
Pigments, mineral:				
Natural, crude	[r]27	10	--	Mainly from India.
Iron oxides and hydroxides, processed	525	857	--	Japan 500; West Germany 225.
Precious and semiprecious stones other than diamond:				
Natural value	$43,211	$486,860	$9,570	Switzerland $238,817; Belgium-Luxembourg $215,132.
Synthetic do.	[r]$8,181	$5,175	$672	Australia $4,293.
Sodium compounds, n.e.s.: Carbonate, manufactured	3,007	308,741	--	United Kingdom 307,258.
Stone, sand and gravel	1,342	1,305	(2)	India 870; Malaysia 112.
Sulfur:				
Elemental, all forms	463	548	--	Singapore 356; Thailand 55; Belgium-Luxembourg 53.
Sulfuric acid	455	353	--	West Germany 151; Singapore 122.
Talc, steatite, soapstone, pyrophyllite	1,070	1,313	2	China 1,039; India 208.
MINERAL FUELS AND RELATED MATERIALS				
Coal: All grades including briquets	313	48,767	--	Republic of South Africa 31,172; Saudi Arabia 16,500.
Coke and semicoke	1,600	958	--	Japan 295; Singapore 245; Republic of South Africa 110.
Petroleum:				
Crude thousand 42-gallon barrels	11,183	14,354	--	Saudi Arabia 6,357; Iran 6,182; Malaysia 1,815.
Refinery products:				
Liquefied petroleum gas value	[r]$350,212	$2,234	--	Mainly from Singapore.
Gasoline 42-gallon barrels	(3)	3,503	--	Mainly from Italy.
Mineral jelly and wax do.	[r]6,808	15,803	63	China 12,836; Japan 1,338.
Kerosine and jet fuel do.	[r]163,170	186,184	--	Kuwait 117,097; Singapore 69,087.
Distillate fuel oil do.	[r]356,174	478,324	--	Mainly from Singapore.
Lubricants do.	[r]89,658	16,465	1,788	Singapore 7,490; Netherlands 2,898; West Germany 2,045.
Bituminous mixtures do.	315	12	--	Mainly from United Kingdom.
Petroleum coke do.	[r]38,638	(2)	--	Mainly from India.
Unspecified do.	156,924	93,821	(2)	Singapore 47,597; West Germany 44,084.

[r] Revised.

[1] Table prepared by Audrey D. Wilkes.

[2] Less than 1/2 unit.

[3] Revised to zero.

VIETNAM[34]

A number of minerals were produced in relatively small quantities, the most important were coal, cement, chromite, phosphate rock, and tin.

A small amount of anthracite, chromite, and tin were exported, but phosphate rock, formerly an important export, has not recovered its previous position since the mines were destroyed in the 1979 border hostilities with China.

Soviet aid played a critical role in the Vietnamese economy in 1983. This aid was particularly apparent in the coal industry where a number of projects were underway or planned to begin soon. The tin industry has also received technical and material assistance from the U.S.S.R. The potentially most important help furnished by the Soviets was a very intensive effort to develop a viable oil exploration program. They have set up an exploration support base at Vung Tau on the coast southeast of Saigon. Vietnam produces a small amount of natural gas but no crude oil. The potential for offshore discovery was considered quite good. U.S. companies announced oil strikes off the Mekong Delta just before the United States withdrawal from Vietnam. The first offshore oil well is believed to have been spudded before yearend.

Comments in the Vietnamese press indicated that management problems in the mineral sector were still not completely resolved and were the basic cause of the failure to meet the planned coal and other mineral production.

Electric power shortages were a continuing problem throughout the country and compounded problems at several mines. New electric power capacity is being added as rapidly as engineering and financing can be arranged. A major step in relieving the immediate shortage was the inauguration of the first generating unit at the Soviet-aided Pha Lai thermal powerplant. The 110,000-kilowatt unit is the first of four similar units.

COMMODITY REVIEW

Metals.—The Tinh Tuc tin mine reportedly overfulfilled its planned output for the year. This was accomplished by reorganizing the production flowsheet and making the transportation of ore and overburden more efficient. The problem of trucks waiting for ore at one working face and shovels waiting to fill trucks at another had been causing a considerable loss of production. The problem was apparently rectified in the third quarter of the year. Management also revised the wage system and awarded increased payments to the workers in accordance with the quality and volume of ore extracted, transported, and sorted. The quality of food available to the miners has been improved, thereby resolving a morale problem that also affected production.

At least one of the pits in the Tinh Tuc mining area was having water-related problems as the open pit operations went deeper. Mud was bogging down vehicles, and makeshift pumps and mud-removing pipes were installed to dry the workings. It was discovered that the waste mud had significant tin content, and screens were installed to recover "several hundreds of kilograms of tin ore."[35]

At the Thap Luc ore bed, efforts were made to move ore a short distance uphill to drier ground so that a small-scale sorting system could be operated during rainy days.

At the Son Duong Mine, the scavenging of ore spilled along the road and from overburden dumps yielded 50 tons of 70% tin concentrate in 1983. Rerunning old tailings at Tinh Tuc through the new concentrator yielded an additional 92 tons of concentrate.

Despite press coverage of tin mining improvements and problems, it was difficult to make realistic assessment of tin production from Vietnam's several operating mines. An improvement of 20% was reported for 1983 for pure tin ore, but it was not stated if this applied to the Tinh Tuc Mine or to production as a whole.

The new tin concentrator at Tinh Tuc was recently completed with Soviet aid and has a design capacity of 555,000 cubic meters of ore per year.

Nonmetals.—*Cement.*—Problems plagued the cement industry during the year even though production jumped to a record high. Some of the problems contributing to the poor performance included electric power, transportation, communications, supplies, work force, and management.

The Bim Son cement plant, built with Soviet aid, began production from its first 600,000-ton-per-year kiln in February 1982 but produced only 132,500 tons in the first 6 months of 1983. Electricity was lost 108 times during the first 9 months for a total of 392 hours. As a result, the kiln was out of operation for 81 days.

Worker training proved to be inadequate for proper operation of the sophisticated plant. Worker attendance and operating problems apparently became serious enough that "each Soviet specialist agreed to work alongside a number of Vietnamese workers and provide them with guidance in everything from arriving at work on time to certain manual skills and the operation of machinery."[36] On-site classrooms were set up to teach both theory and practical application to the workers, the majority of whom were recruited from the countryside and had no mechanical or technical experience. By yearend, the Vietnamese workers were "able to operate practically all of the machinery and equipment at the plant."[37]

Problems of management have been mentioned by Government officials and in the party press. The fact that a new plant was operating at only 44% of capacity after 2 years showed the inadequacy of planning and management that pervade the cement industry.

The second kiln at Bim Son was put into trial production in November and operated satisfactorily for 5 hours. The new kiln was expected to be officially inaugurated before yearend. It was interesting to note that the planned production for Bim Son was set at 500,000 tons or 42% of capacity for 1984. This could indicate that raw materials, transportation, or electricity supply problems had not been solved and that management did not realistically expect improvement during 1984.

The Hoang Thach cement plant began trial operation with good results in 1983. This 1-million-ton-per-year plant, constructed with Danish and Japanese aid, has received little press coverage. Smooth operation of the Hoang Thach and Bim Son plants could easily double the 1983 production in 1984.

The old Haiphong cement plant produced 160,500 tons during the first 6 months of 1983 and was the only plant to meet its production goal.

The small vertical kiln, batch-type cement plants, operated by city or Province authorities, produced 132,000 tons of cement for local consumption. This locally produced material had adequate strength for small building projects, created local employment, and lessened the burden on the overtaxed transportation sector.

A 1-million-ton-per-year production line has been under construction for several years at the old Ha-tien cement plant 245 kilometers west of Saigon. The plant was being aided by France.

With completion of the Ha-tien plant, over 3 million tons of new capacity will be available to the Vietnamese construction industry. Movement of this material to market by the already inefficient transportation network is expected to be very difficult and could limit production unless an efficient distribution system is implemented.

Fertilizer Materials.—The Lao Cai apatite mine continued to increase production, but at a rate that is believed to have been disappointing to planning and trade officials. Vietnam was formerly a major exporter of apatite, but Vietnamese production capacity was virtually destroyed in 1979 during the border conflict with China. Since then, the mine has been slow in regaining old production levels. Production was less than 9% of the 1978 level in 1982 and only climbed to 11% of the 1978 level in 1983. For 1984, the plan is to produce enough ore to make 270,000 tons of superphosphate and 100,000 tons of roasted phosphate.

The Van Dien phosphate fertilizer plant in Hanoi increased its output significantly by remodeling the kiln and support equipment to take domestic anthracite coal rather than expensive imported coke. The new capacity of the kiln is 50,000 tons per year.

Sulfur.—Geologic exploration has been completed and overburden removal began at the Giap Lai Mine, Vietnam's first iron pyrite mine. The mine is located in Vinh Phu Province northwest of Hanoi. More than 300 workers and cadre are reportedly working around the clock. "Combining manual work with mechanization, the work site has peeled off hundreds of thousands of cubic meters of earth and rock."[38] An additional deeper lying ore body was being investigated.

Mineral Fuels.—*Coal.*—Despite emphasis on increasing coal production and exports, the tenor of Government press releases indicated that this, the third year of the 1981-85 plan, was not a complete success. Transportation problems continued to limit efficient distribution of coal. Also, maintenance of mine equipment and vehicles was extremely poor by world standards and was recognized as a major problem by high Government officials. Poor worker training, poor food, and low morale also contributed to inefficiencies of the coal sector.

The Soviet Union has been helping the coal industry expansion since the 1960s. It has supplied project planning, equipment, construction materials, and on-site technical instruction. Of the 12 major operating coal mines, 6 were built and expanded with Soviet help. These six produced over 80% of the 1983 production. Several factories specializing in repairing and manufacturing spare parts for coal mining equipment were also aided by the Soviets. Despite the aid, the output of coal has not risen in proportion to the capacity of the new and expanded mines. To combat the problems mentioned above, the Soviets have agreed to greatly increase the technical and financial assistance so that all existing projects can operate satisfactorily. The vehicle maintenance installations will be expanded for general repairs.

In addition to bringing the mines to their designed output, the two Governments have agreed to develop additional mines and expand existing ones. The agreement covers the following:

1. The expansion of the Na Duong coal mine from 200,000 to 600,000 tons per year. This project is expected to ensure an adequate supply of high-quality coal to the Bim Son and Haiphong cement plants. It is expected that mine production would be 400,000 tons per year by 1985. Expansion of the Na Duong Mine began in 1983.
2. Expansion of the Mae Khe Mine from 500,000 to 2,100,000 tons per year and the addition of the coal sorting plant. The output will be dedicated to the new Pha Lai thermal powerplant, the largest thermal powerplant in the country.
3. Expansion of the He Nui Hong coal mine from 100,000 to 500,000 tons per year.
4. Acceleration of the construction of the

Cam Pha engineering plant and the Cam Pha truck overhaul factory. These plants will be designed to make spare parts and to handle major repairs on all types of vehicles and mining equipment.

5. Preparations for the construction of the Nui Beo coal mine.

Petroleum and Natural Gas.—The Soviet Union has delivered more than $128 million of oil and gas exploration-development equipment to Vietnam since 1980. They have been trying to build a Vietnamese capability to explore the promising areas off the Mekong and Red River Deltas. They are particularly optimistic about the Mekong Delta where U.S. oil companies reported favorable oil strikes in 1974.

Earlier onshore exploration yielded a small natural gasfield southeast of Hanoi. The output from the field is currently dedicated to operating a gas-turbine-powered electric powerplant.

This year's aid by the Soviets was highlighted by the July delivery of a 1,600-ton-capacity floating crane to Vung Tau after a 13,000-kilometer tow from the Baltic Sea. The crane will be used to assemble drilling platforms at sea.

The joint venture company Vietsovpetro, which was formed in 1982 after the last of the foreign concessionaires withdrew, was believed to have started drilling by yearend 1983 off the Mekong Delta from a fixed platform.

It is estimated that Vietnam imported between 1.8 and 2.0 million tons of refined oil products during the year. Even at the concessional rates granted by the Soviets, this $400 million outlay was a severe burden on Vietnam's poor economy. Any crude oil strike that can be brought into production at less than what Vietnam is currently paying for imported petroleum would be expected to be developed. Not only would it benefit Vietnam, it would ease the Soviet burden of transporting and financing the imports each year.

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[1] By Gordon L. Kinney, physical scientist, Division of Foreign Data.

[2] The Bangladesh fiscal year begins July 1 of year stated.

[3] The Bangladesh Observer (Dhaka) in English. Dec. 13, 1983, pp. 1, 12.

[4] Page 12 of work cited in footnote 3.

[5] Oil and Gas Journal. V. 81, No. 49, Dec. 5, 1983, p. 67.

[6] Modern Asia. V. 17, No. 8, Sept. 1983, pp. 60-65.

[7] Chemical Industry News (Calcutta). V. 28, No. 7, Nov. 1983, p. 579.

[8] By Charles L. Kimbell, senior foreign mineral specialist, Division of Foreign Data.

[9] By E. Chin, physical scientist, Division of Foreign Data.

[10] Hong Kong Government. 1983 Annual Report. 325 pp.

[11] Where necessary, values have been converted from Hong Kong dollars (HK$) to U.S. dollars at the rate of HK$6.81 = US$1.00 for 1983.

[12] By Gordon L. Kinney, physical scientist, Division of Foreign Data.

[13] By E. Chin, physical scientist, Division of Foreign Data.

[14] By Gordon L. Kinney, physical scientist, Division of Foreign Data.

[15] Summary of World Broadcasts. Far East/W1261/A/23, Nov. 9, 1983.

[16] Vientiane, HENG NGAN in Lao 1-15. June 1983, p. 5 out of JPRS 84400 Sept. 26, 1983 SE ASIA Rep. 1343.

[17] By John C. Wu, economist, Division of Foreign Data.

[18] Where necessary, values have been converted from Mongolian tugriks (Tug) to U.S. dollars at the rate of Tug3.355 = US$1.00.

[19] Far Eastern Economic Review (Hong Kong). Asia 1984 Yearbook. P. 224.

[20] Novosti Mongolii (Waanbaatar). Industrial Giant of MPR. Oct. 28, 1983, p. 2.

[21] ———. Pride in One's Collective. June 10, 1983, p. 2.
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[22] By Gordon L. Kinney, physical scientist, Division of Foreign Data.

[23] Shrestha, P. L. The Past, Present Situation and Future Prospect of Mineral Resources Development in Nepal. Miner. Explor. Dev. Board Tech. Paper TP/24/81, Feb. 1981.

[24] Where necessary, values have been converted from Nepalese rupees (NRs) to U.S. dollars at the rate of NRs14.0 = US$1.00 during 1983.

[25] By E. Chin, physical scientist, Division of Foreign Data.

[26] Where necessary, values have been converted from Singapore dollars (S$) to U.S. dollars at the rate of S$2.13 = US$1.00.

[27] Department of Statistics (Singapore). Monthly Digest of Statistics. V. 23, No. 4, Apr. 1984, 140 pp.

[28] By Gordon L. Kinney, physical scientist, Division of Foreign Data.

[29] Indian Mining & Engineering Journal. V. 22, No. 6, June 1983, p. 38.

[30] Where necessary, Sri Lankan rupees (SLr) have been converted at the rate of SLr20.85 = US$1.00.

[31] Mining Magazine. V. 150, No. 5, May 1984, p. 464.

[32] Industrial Minerals (London). No. 193, Oct. 1983, p. 65.

[33] Petroleum News. V. 14, No. 10, Jan. 1984, p. 88.

[34] By Gordon L. Kinney, physical scientist, Division of Foreign Data.

[35] Hanoi Nhan Dan in Vietnamese. Nov. 2, 1983, p. 2.

[36] ———. Nov. 3, 1983, p. 2.

[37] Work cited in footnote 35.

[38] Hanoi press release in Vietnamese. Mar. 21, 1984, p. 3.

Table 15.—Vietnam: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Principal destinations, 1982
METALS			
Aluminum: Metal including alloys, all forms	NA	63	Hong Kong 45; Japan 18.
Chromium: Ore and concentrate	7,942	NA	
Copper: Metal, scrap	NA	1,333	All to Hong Kong.
Tin: Metal including alloys, unwrought	NA	110	France 50; Hong Kong 50.
NONMETALS			
Diatomite and other infusorial earth	NA	116	All to Singapore.
Precious and semiprecious stones other than diamond: Natural value, thousands	$1	NA	
Stone, sand and gravel: Dimension stone:			
Crude and partly worked	5	NA	
Worked	NA	880	Mainly to Hungary.
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Anthracite and bituminous	26,576	120,707	Japan 101,257; France 11,609.
Briquets of anthracite and bituminous coal	4,000	NA	

[p] Preliminary. NA Not available.

[1] Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by Vietnam, this table should not be taken as a complete presentation of this country's mineral trade. These data have been compiled from United Nations information and data published by the partner trade countries.

Table 16.—Vietnam: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982[p]	Principal sources, 1982
METALS			
Alkaline-earth metals	1	NA	
Aluminum:			
Oxides and hydroxides	21	105	All from Hong Kong.
Metal including alloys, all forms	277	616	Hungary 317; Japan 142; Singapore 104.
Chromium: Oxides and hydroxides	NA	2	All from Hong Kong.
Cobalt: Oxides and hydroxides	2	6	France 4; Japan 2.
Copper: Metal including alloys:			
Unwrought	6	102	Mainly from Peru.
Semimanufactures	221	[2]2	Singapore 1; United Kingdom 1.
Iron and steel: Metal:			
Pig iron, cast iron, related materials	NA	5	All from Finland.
Ferroalloys	NA	200	All from Japan.
Steel, primary forms	NA	19	Sweden 12.
Semimanufactures:			
Bars, rods, angles, shapes, sections	8,214	3,545	Singapore 1,459; Japan 1,337.
Universals, plates, sheets	8,393	5,911	Japan 3,685; Hungary 984; Singapore 601.
Hoop and strip	590	118	Japan 95; Sweden 23.
Rails and accessories	19	34	All from Belgium-Luxembourg.
Wire	1,221	1,338	Japan 1,051; Hong Kong 254.
Tubes, pipes, fittings	1,490	422	Japan 211; Hong Kong 101; Sweden 66.
Castings and forgings, rough	6	NA	
Lead: Metal including alloys, unwrought	NA	306	All from Japan.
Manganese: Oxides	70	95	Japan 75; Hong Kong 20.
Mercury 76-pound flasks	NA	71	All from Hong Kong.
Molybdenum: Metal including alloys, all forms kilograms	116	49	All from Japan.
Nickel: Metal including alloys, semimanufactures	([3])	NA	
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	1,360	NA	
Silver: Metal including alloys, unwrought and partly wrought value, thousands	--	$1	Do.
Tin: Metal including alloys, all forms	NA	1	Mainly from France.
Titanium: Oxides	158	107	Japan 75; Hong Kong 30.
Tungsten: Metal including alloys, all forms kilograms	372	342	All from Japan.
Zinc:			
Oxides	77	322	Japan 258; Hong Kong 52.
Metal including alloys:			
Unwrought	2	NA	
Semimanufactures	2	145	All from Singapore.
Other: Oxides and hydroxides	22	2	All from Japan.

See footnotes at end of table.

Table 16.—Vietnam: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982^{p}	Principal sources, 1982
NONMETALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc	NA	123	France 100.
Artificial: Corundum	NA	12	All from Hong Kong.
Grinding and polishing wheels and stones	36	7	Japan 4; Sweden 2.
Boron materials: Oxides and acids	NA	5	Singapore 3; Hong Kong 2.
Cement	75,011	132,811	Philippines 55,200; U.S.S.R. 34,000; Japan 28,284.
Clays, crude	49	1,261	All from Singapore.
Diatomite and other infusorial earth	750	200	All from Japan.
Feldspar, fluorspar, related materials	NA	240	Do.
Fertilizer materials: Manufactured:			
Ammonia	3,510	26	Do.
Nitrogenous	348,804	513,147	U.S.S.R. 445,424; Japan 45,000.
Phosphatic	1,000	NA	
Potassic	26,734	4,897	All from U.S.S.R.
Unspecified and mixed	10	29,250	Japan 15,250; France 13,500.
Magnesium compounds:			
Magnesite	NA	700	All from Japan.
Oxides and hydroxides	7	NA	
Mica: Worked including agglomerated splittings	4	1	All from Hong Kong.
Phosphates, crude	20	NA	
Phosphorus, elemental	NA	27	All from Japan.
Pigments, mineral: Iron oxides and hydroxides, processed	3	1	All from Hong Kong.
Precious and semiprecious stones other than diamond: Synthetic value, thousands	NA	$3	All from Japan.
Pyrite, unroasted	NA	20,000	All from U.S.S.R.
Sodium compounds, n.e.s.:			
Carbonate, natural and manufactured	NA	253	France 200; Hong Kong 50.
Sulfate, natural and manufactured	NA	300	All from Hong Kong.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	20	NA	
Worked	NA	51	All from Italy.
Quartz and quartzite	26	NA	
Sand other than metal-bearing	337	177	All from Sweden.
Sulfur:			
Elemental: Crude including native and byproduct	4,000	NA	
Sulfuric acid	19	110	All from Hong Kong.
Talc, steatite, soapstone, pyrophyllite	202	37	Hong Kong 22; Japan 15.
Other: Slag and dross, not metal-bearing	255	NA	
MINERAL FUELS AND RELATED MATERIALS			
Carbon: Carbon black	185	523	Japan 445; Hong Kong 57.
Coke and semicoke	2,500	370	All from Japan.
Petroleum refinery products:			
Liquefied petroleum gas 42-gallon barrels	NA	12	All from Finland.
Gasoline do	425	560	Mainly from Singapore.
Mineral jelly and wax do	614	4,525	Hong Kong 4,226; Singapore 212.
Kerosine and jet fuel do	1,363	8,714	West Germany 6,634; Thailand 2,026.
Distillate fuel oil do	4,461	2,819	West Germany 2,387; Singapore 425.
Lubricants do	4,317	158,969	Italy 102,375; Japan 47,934.
Bitumen and other residues do	60,600	10,605	Japan 6,060; Singapore 4,545.
Bituminous mixtures do	NA	127	All from Japan.
Unspecified do	75	548	Japan 535.

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^{p}Preliminary. NA Not available.

[1] Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by Vietnam, this table should not be taken as a complete presentation of this country's mineral trade. These data have been compiled from United Nations information and data published by the partner trade countries.

[2] Excludes exports from Japan and Sweden valued at a total of $3,000.

[3] Less than 1/2 unit.

The Mineral Industry of Other Near East Countries

By Peter J. Clarke[1]

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AFGHANISTAN

The Soviet-controlled Government in Afghanistan continued to emphasize development of the country's mineral resources, primarily to supply raw materials and fuel to industrial areas in the Soviet Central Asian republics. In addition to expanding production of natural gas for export to the U.S.S.R., a $600 million[2] Soviet-Afghan cooperation project, 1 of 167 such projects established since 1981, was devoted to exploiting the Ainak copper deposit, south of Kabul in Logar Province. Also being developed was the large Hajigak iron ore deposit in the Hindu Kush Mountains, 100 kilometers northwest of Kabul. In addition to these minerals, Afghanistan already produced small quantities of barite, cement, coal, gypsum, salt, and possibly some lapis lazuli. Afghanistan was the world's leading producer of lapis lazuli, a semiprecious gem stone, prior to the Soviet invasion in 1978, but production, although no longer reported, has probably been significantly reduced. It was also reported that Soviet mining engineers and technicians have commenced producing uranium from Lashkangah in the mountainous Khawaja Rawash area near Kabul.[3] The Government was also considering mining chromite from Herserak and Muhammed Agha Kulanger, near the border with Pakistan.[4]

Afghanistan's overall economy remained stagnant in 1983, a result of continuing armed resistance to the Soviet-installed government. The gross domestic product (GDP) was estimated at about $2.8 billion, only marginally higher than the 1982 level. The value of exports was estimated at $720 million, up less than 2% over that of 1982, while imports rose approximately 8% over the same period. Natural gas was by far the leading export, earning about $295 million, up 4% over that of 1982. Approximately 90% of Afghanistan's natural gas production was exported to the U.S.S.R. Gas exports were used to pay the country's debt to the U.S.S.R., and also to pay for its supplies of petroleum products and other goods, which were imported almost exclusively from the Soviet Union. Some of Afghanistan's petroleum products were supplied by the U.S.S.R. as grants in aid, as Afghanistan did not have any domestic petroleum refining capacity.

Natural gas production rose only slightly in 1983, to about 280 million cubic feet per day. Gas was produced from two large nonassociated gasfields in Shibarghan Province in northeastern Afghanistan, only 100 kilometers from the Soviet border. The Khawaga Gogerdak Field has been producing gas since the mid-1960's, and reserves were estimated at 1.45 trillion cubic feet—800 billion cubic feet of sweet gas from an upper horizon and 650 billion cubic feet of high-sulfur sour gas from a lower horizon. The Jarqaduq Field was brought into production in 1982, and output was to increase over the next several years to over 200 million cubic feet per day. Processing facilities for the high-sulfur gas were installed at the field to make the gas suitable for pipelining. A 100-kilometer, 81-centimeter pipeline running from Gogerdak across the Amu Darya River into the U.S.S.R. was being expanded to handle increased gas supplies from Jarqaduq. Reserves at Jarqaduq were estimated at 1 trillion cubic feet. The Soviets, who received 232 million cubic feet per day of gas from Afghanistan, were planning to raise production to accommodate imports of 540 million cubic feet per day by 1985.

Because most of Afghanistan's gas was exported to the U.S.S.R., domestic powerplants and industrial projects were forced to use coal as an energy source. The largest coal producer was the Darra-i-Suf Mine, 160 kilometers south of Mazar-i-Sharif, although smaller quantities were produced from the Karkar and Ishpushta Mines in northern Afghanistan near Pul-i-Khumri. Although no coal production data were available, development of the country's coal resources was a high priority of the Government, and expansion of output from the Darra-i-Suf Mine was reportedly underway.

The Afghan Government's largest commitment to minerals was for the Ainak copper project, where a mine and mill were under construction to produce 114,000 tons of copper concentrates annually. A smelter was also to be built at the minesite, with assistance from the U.S.S.R. and Czechoslovakia. The Ainak deposit contained 280 million tons of 0.7% to 1.5% copper ore. The $600 million project was expected to start production in 1985.

Also reportedly under development was the 1.7-billion-ton Hajigak iron ore deposit in the Hindu Kush Mountains northwest of Kabul. The deposit contains mixed hematite and magnetite, averaging 62% iron. The Soviets reportedly commenced development of the deposit in 1983[5] in order to supply steel mills in the Tashkent region of Soviet Central Asia. Afghanistan had no domestic steel industry.

Other minerals that were reportedly produced, although no reliable data were available, were barite, from the Songilyan Mine 65 kilometers northwest of Harat; cement, from three plants, at Ghori, Jabel Saraj, and Harat, where annual capacities were 120,000 tons, 36,000 tons, and 210,000 tons, respectively; lapis lazuli from Sare Sang in a remote area of the Hindu Kush Mountains; asbestos; gypsum; rock salt; and talc. Two chromite deposits at Herserak and Muhammed Agha Kulanger in Logar Province in southern Afghanistan near the Pakistan border were being considered for development.

Finally, reports from Pakistan indicated that the Soviets may have commenced production of uranium from the mountains of Khawaja Rawash near Kabul. The project was restricted to Soviet personnel in an effort to maintain security. All the output was, of course, exported to the Soviet Union.[6]

Table 1.—Other countries of the Near East: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Country and commodity	1979	1980	1981	1982[p]	1983[e]
AFGHANISTAN[2]					
Asbestos	4,000	--	--	NA	NA
Barite	3,000	3,000	1,000	[e]2,000	2,000
Cement, hydraulic	[r]141,000	[e]50,000	[e]95,000	[e]120,000	150,000
Coal, bituminous	100,000	--	50,000	[e]60,000	70,000
Gas, natural:					
Gross million cubic feet	70,000	[e]70,000	97,500	100,000	102,000
Marketed do.	60,000	[e]60,000	79,000	81,225	[3]84,755
Gem stones: Lapis lazuli kilograms	6,000	--	--	NA	NA
Gypsum	--	--	--	3,000	5,000

See footnotes at end of table.

Table 1.—Other countries of the Near East: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country and commodity	1979	1980	1981	1982[p]	1983[e]
AFGHANISTAN[2] —Continued					
Natural gas liquids thousand 42-gallon barrels	[3]10	5	5	110	110
Nitrogen: N content of ammonia[e]	27,216	[r]9,979	[r]9,070	8,000	8,000
Salt, rock[e]	[3]20,000	5,000	6,000	10,000	10,000
Talc	500	--	--	--	--
BAHRAIN					
Aluminum metal: Primary, smelter	126,000	126,152	141,000	170,960	[3]170,000
Gas, natural:					
Gross million cubic feet	143,449	123,442	122,000	130,507	[3]139,325
Marketed do	102,950	97,468	78,059	91,373	[3]96,321
Natural gas liquids:					
Butane thousand 42-gallon barrels	485	875	817	890	[3]914
Propane do	NA	1,000	1,028	986	[3]996
Naphtha do	NA	986	1,170	1,139	[3]1,209
Petroleum:					
Crude do	18,741	18,338	16,902	16,067	[3]15,164
Refinery products:					
Gasoline do	9,249	8,869	11,173	10,068	[3]4,993
Jet fuel do	11,803	13,797	13,456	8,341	[3]9,984
Kerosine do	868	547	2,617	2,676	[3]1,096
Distillate fuel oil do	23,574	20,586	25,270	19,515	[3]16,848
Residual fuel oil do	30,640	27,046	28,648	19,866	[3]16,344
Lubricants do	130	375	22	363	[3]2,340
Other do	13,201	[e]12,300	12,615	9,975	[3]10,881
Refinery fuel and losses do	2,245	[e]2,100	2,177	1,534	[3]1,822
Total do	91,710	[e]85,620	95,978	72,338	[3]64,308
Sulfur, byproduct of petroleum do	25,148	32,559	36,000	34,060	[3]49,275
LEBANON[2]					
Cement, hydraulic thousand tons	2,122	[r]1,484	2,391	1,800	1,000
Gypsum	9,750	[e]10,000	9,500	[e]5,000	5,000
Iron and steel:					
Steel, crude thousand tons	--	--	--	--	--
Semimanufactures do	220	[e]220	185	[e]150	100
Lime[e] do	120	120	61	50	20
Petroleum refinery products:[e]					
Gasoline thousand 42-gallon barrels	[3]3,498	3,400	3,000	2,400	2,300
Jet fuel do	[3]923	900	600	400	300
Kerosine do	[3]175	150	100	50	50
Distillate fuel oil do	[3]2,609	2,600	2,400	2,000	2,000
Residual fuel oil do	[3]5,237	5,000	4,300	3,800	3,500
Liquefied petroleum gas do	[3]361	300	300	200	175
Unspecified do	[3]212	200	200	150	125
Refinery fuel and losses do	[3]887	800	600	500	400
Total do	[3]13,902	13,350	11,500	[e]9,500	8,850
Salt[e] thousand tons	10	12	15	10	5
OMAN					
Cement, hydraulic	--	--	--	--	2,200
Chromite, gross weight	--	--	--	--	24,000
Copper:					
Mine output, metal content	--	--	--	--	14,000
Smelter	--	--	--	--	5,000
Refinery	--	--	--	--	5,000
Gas, natural:					
Gross million cubic feet	122,000	[e]117,000	[3]174,835	188,000	195,000
Marketed do	17,657	21,189	45,000	75,000	[3]86,700
Marble thousand tons	--	--	[e]20	50	[3]33
Natural gas liquids:[e]					
Butane thousand 42-gallon barrels	30	40	[3]46	50	50
Propane do	4	5	[3]5	5	5
Natural gasoline do	450	600	[3]730	800	800
Petroleum:					
Crude do	107,845	103,528	119,808	122,598	137,970
Refinery products:					
Gasoline do	--	--	--	--	1,500
Jet fuel do	--	--	--	--	1,000
Kerosine do	--	--	--	--	500

See footnotes at end of table.

Table 1.—Other countries of the Near East: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country and commodity	1979	1980	1981	1982^{p}	1983^{e}
OMAN —Continued					
Petroleum —Continued					
Refinery products —Continued					
Distillate fuel oil thousand 42-gallon barrels	--	--	--	--	3,000
Residual fuel oil do.	--	--	--	--	2,500
Liquefied petroleum gas do.	--	--	--	--	500
Naphtha do.	--	--	--	--	300
Unspecified do.	--	--	--	--	200
Refinery fuel and losses do.	--	--	--	--	100
Total do.	--	--	--	--	9,600
Sand and gravel thousand tons	NA	102	^{e}800	1,343	[3]4,829
Stone, unspecified do.	NA	329	^{e}3,000	6,220	[3]11,224
QATAR[2]					
Cement, hydraulic do.	237	209	258	261	[3]248
Gas, natural:					
Gross million cubic feet	235,795	224,000	222,000	^{e}190,000	[3]202,136
Marketed do.	154,041	79,935	94,250	^{e}95,000	100,000
Iron and steel, semimanufactures thousand tons	^{r}379	^{r}440	453	475	[3]477
Natural gas liquids thousand 42-gallon barrels	77	^{e}265	6,126	6,516	10,340
Nitrogen: N content of ammonia	303,400	418,000	366,612	434,016	[3]481,692
Petroleum:					
Crude thousand 42-gallon barrels	184,772	172,554	146,370	120,289	[3]102,000
Refinery products:					
Gasoline do.	921	^{e}950	1,144	1,010	[3]1,097
Jet fuel do.	512	450	480	478	[3]442
Kerosine do.	31	33	33	32	[3]69
Distillate fuel oil do.	939	^{e}1,000	1,764	1,320	[3]1,359
Other^{e} do.	75	75	75	75	[3]82
Refinery fuel and losses and partly finished oil do.	1,500	^{e}1,500	1,500	1,086	NA
Total do.	3,978	4,008	4,996	4,001	[3]3,049
Stone: Limestone thousand tons	3,000	2,036	2,300	2,185	1,600
Sulfur	--	--	5,600	5,475	5,000
SYRIA					
Asphalt, natural thousand tons	83	89	90	71	[3]54
Cement, hydraulic do.	1,847	1,995	2,150	2,850	[3]2,850
Gas, natural:^{e}					
Gross million cubic feet	60,000	60,000	55,000	52,000	[3]62,050
Marketed do.	7,500	7,000	8,000	9,000	[3]15,890
Gypsum	63,500	78,636	79,545	^{e}80,000	350,000
Iron and steel: Steel, crude thousand tons	110	110	110	99	67
Nitrogen: N content of ammonia	^{r}21,000	^{r}39,000	^{r}30,000	64,900	[3]113,400
Petroleum:					
Crude thousand 42-gallon barrels	68,709	60,656	58,990	55,625	[3]61,320
Refinery products:					
Gasoline do.	4,745	5,073	4,818	^{e}5,255	5,300
Kerosine and jet fuel do.	2,920	3,650	4,051	^{e}4,400	4,500
Distillate fuel oil do.	6,935	18,980	30,998	^{e}32,000	33,000
Residual fuel oil do.	10,585	10,950	14,231	^{e}17,700	18,000
Liquefied petroleum gas do.	1,825	657	1,423	^{e}1,500	1,800
Asphalt do.		1,497	2,227	^{e}2,250	2,300
Refinery fuel and losses do.	730	1,241	1,752	^{e}1,800	1,800
Total do.	27,740	42,048	59,500	^{e}64,905	66,700
Phosphate rock thousand tons	1,272	1,319	1,321	1,455	[3]1,229
Salt do.	75	90	90	102	[3]87
Stone, sand and gravel:					
Stone: Dimension, marble cubic meters	71,562	84,860	60,000	20,000	[3]71,000
Sand and gravel thousand tons	20	19	^{e}20	205	[3]5,780
Sulfur, byproduct of petroleum and natural gas do.	4	^{e}5	6	22	30
PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN					
Petroleum refinery products:^{e}					
Gasoline thousand 42-gallon barrels	1,000	1,000	1,800	2,000	2,200
Jet fuel do.	1,200	1,200	2,000	2,300	2,500

See footnotes at end of table.

Table 1.—Other countries of the Near East: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country and commodity	1979	1980	1981	1982[p]	1983[e]
PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN —Continued					
Petroleum refinery products[e] —Continued					
Kerosine thousand 42-gallon barrels	800	800	1,200	1,500	1,800
Distillate fuel oil do	2,500	2,500	3,000	3,500	4,000
Residual fuel oil do	6,000	6,000	12,000	13,000	14,000
Other do	800	800	1,200	1,500	1,800
Refinery fuel and losses do	870	870	1,000	1,200	1,200
Total do	13,170	13,170	22,200	25,000	27,500
Salt[e] thousand tons	80	80	75	75	75
YEMEN ARAB REPUBLIC[2]					
Cement do	90	81	82	237	[3]600
Gypsum	NA	NA	[e]20,000	21,923	[3]23,138
Salt[e] thousand tons	90	65	65	57	141

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1] Table includes data available through Aug. 1, 1984.

[2] In addition to the commodities listed, a variety of other crude construction materials (clays, stone, and sand and gravel) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

BAHRAIN

Despite the almost secondary importance of crude oil production to Bahrain's economy, the Organization of Petroleum Exporting Countries' (OPEC) decision to reduce crude oil prices by $5 per barrel in March created a slight revenue shortfall and worsened an already significant deficit in the balance of payments. Although the Government had managed to diversify the economy into aluminum production, ship repair, gas liquefaction, and financial services, oil still accounted for 68% of the Government's revenue, but only 25% of the GDP of $5.5 billion[7] in 1983. Continued high levels of aid from its primary benefactor, Saudi Arabia, as well as prudent management of the economy and the extension or stretching out of major development projects, allowed the economy to grow 5% in real terms, only slightly lower than the 9% and 6% real growth experienced in 1981 and 1982, respectively.

Bahrain's crude oil production continued its steady decline from over 44,000 barrels per day in 1982 to 41,545 barrels per day in 1983. This oil accounted for only 43% of Bahrain's oil revenues, with the remaining 57% derived from exports of crude oil from the Abu Safaa Oilfield, owned and operated by Saudi Arabia, but revenues from which were divided equally between Saudi Arabia and Bahrain. Oil revenue from these two fields was $981 million, down over 25% from that of 1982, a result of both lower production and a lower OPEC price. Proven reserves in the Awali Field, Bahrain's only oilfield, were 200 million barrels, and were not expected to last much beyond the year 2000.

The 100% state-owned Bahrain National Oil Co. (Banoco) was responsible for all oil production and exploration onshore and in its territorial waters except for a 660,000-acre, 35-year exploration concession granted in 1983 to the Kuwait Foreign Petroleum Exploration Co. This area was relinquished by the Superior Oil Co. of the United States after drilling three dry holes. Banoco was considering undertaking a major exploration effort in its own areas following completion of onshore and offshore seismic surveys by Western Geophysical Co. of the United States and Compagnie Générale de Geophysique of France.[8] Bahrain has not discovered any new commercial oil reserves in the last 30 years.

Natural gas, on the other hand, presented a more promising outlook in 1983. Total natural gas output increased almost 7%, with the quantity sold to industry or used in producing natural gas liquids (NGL), rising 5.5%. Natural gas reserves were 7.8 trillion cubic feet, most of which was nonassociated gas from the Permian Khuff Formation. Production of nonassociated gas reached about 275 million cubic feet per day, or roughly 72% of the country's total gas output, with the remainder being associated gas produced from the Awali Oilfield. All of the associated gas was fed to the Bahrain

National Gas Co.'s (Banagas) liquefied petroleum gas (LPG) plant located at Jabal. The plant was designed to process 110 million cubic feet per day of previously flared gas to produce 80,000 tons of propane per year, 79,000 tons of butane per year, 125,000 tons of naphtha per year, and 86 million cubic feet per day of lean residue gas, all of which was delivered to the aluminum plant. All the naphtha was supplied to Bahrain's only petroleum refinery. Total gas consumption in Bahrain was running above capacity, at about 127 million cubic feet per day, and additional supplies of nonassociated gas were delivered to the plant to raise output. A $3 million project was underway to further raise gas processing capacity to 146 million cubic feet per day. The Banagas facility consumed roughly 31% of the country's gas output, with another 30% reinjected, 28% consumed in electricity production, and 10% used by Aluminum Bahrain (ALBA). Banagas was also responsible for delivering gas into the domestic distribution system, which provided fuel to local industries.[9]

Bahrain's other major energy processing facility was the 250,000-barrel-per-day Sitra refinery, where refined product output fell again, to 176,186 barrels per day, down 33% from its peak output in 1981. Because Bahrain's domestic crude oil supplied only 23% of the refinery's input, the rest was imported at official OPEC prices from Saudi Arabia. This high-cost crude reduced the profitability of the refinery greatly, and forced closure of the Arabia-Bahrain pipeline between Saudi Arabia and Bahrain, through which the refinery's oil was delivered, for almost a month. With the realignment of prices in March, Bahrain's products regained competitiveness, and the refinery was able to raise output. The refinery was owned by Bapco BSC, a joint company composed of the Government, 60%, and California Texas Petroleum Co. (Caltex), a joint venture of Texaco Inc. and Standard Oil Co. of California, 40%. To further boost throughput, Bapco was processing oil for India as a third-party contractor for part of the year.

Bahrain's initial plans to build the Heavy Oil Conversion Co. (HOCC) for $2 billion to refine lower priced heavy oil at the Sitra refinery were undergoing further study in light of a more competitive products market expected in the second half of the decade. The HOCC was to be a joint venture of Banoco, 40%; Kuwait Petroleum Corp., 30%; and Saudi Arabia's Ministry of Petroleum and Mineral Resources, 30%. C. E. Lummus of the United States completed a $400,000 feasibility study, but new plans were being considered to integrate HOCC into the Sitra refinery with a potential cost savings of $200 to $300 million.[10] The hydrocracking plant was to have a capacity of 80,000 barrels per day and was to process heavy oil and surplus fuel oil from several Persian Gulf countries.

The Gulf Petrochemical Industry Co. (GPIC) was constructing another facility to be integrated with the Sitra refinery. Snamprogetti S.p.A. of Italy was building the plant, which was to produce 1,000 tons per day of ammonia and 1,000 tons per day of methanol, utilizing a mixture of NGL and naphtha feedstock. Uhde GmbH of the Federal Republic of Germany was supplying the process technology for the $400 million facility. Construction was expected to be completed in 1984. GPIC was an equally shared joint venture of the Governments of Bahrain, Kuwait, and Saudi Arabia. Kuwait's Petrochemical Industrial Co. was to handle marketing of ammonia for the first 5 years, and the Saudi Arabian Basic Industries Corp. was expected to market the methanol.[11]

In the nonfuel minerals sectors, aluminum production was at full capacity of 170,000 tons in 1983 from ALBA's smelter. ALBA was owned 57% by the Bahrain Government, 20% by Saudi Arabia, 17% by Kaiser Aluminum Bahrain of the United States, and 5.1% by Breton Investments of the United Kingdom. The combined 78% share of the output owned by Saudi Arabia and Bahrain was marketed by the Bahrain Aluminum Co. (BALCO). BALCO returned to profitability in 1983, making $30 million after posting a $22 million loss in 1982. Bahrain exported 215,000 tons of aluminum by reducing its inventory stock from 100,000 to 50,000 tons. Bahrain's domestic aluminum industry was supplemented by the Bahrain Aluminum Extrusion Co. (Balexco), owned 100% by the Government, which produced aluminum cladding, doors, and window frames for the construction industry. Nearly 80% of Balexco's output was exported. Also utilizing ALBA's output was Midal Cables, a private cable manufacturer, 29% of which was owned by the Saudi Cable Co. of Saudi Arabia. Midal Cables produced aluminum rods from hot metal fed directly from the smelter.

The six Persian Gulf states of Bahrain, Kuwait, Saudi Arabia, Iraq, Oman, and

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Qatar were combining on a joint project to build the Gulf Aluminum Rolling Mill Co. The mill was to produce 40,000 tons per year of aluminum sheets, coils, and foil stock. Kobe Steel Ltd. was constructing the plant with Kaiser Engineers and Contractors of the United States acting as project consultants. Shares in the $100 million mill were held 10% each by Oman and Qatar, with the remaining four countries holding 20% each.[12] The last domestic consumer of ALBA's output was the Bahrain Atomiser International aluminum powder plant, which was built in 1972. The plant was owned 51% by the Bahrain Government and 49% by Breton Investments. It was capable of producing 7,000 tons per year of aluminum powder from molten aluminum. Most of the output was sold by Breton.

Bahrain was planning to enter another metal industry through construction of the Arab Iron and Steel Co.'s 4-million-ton-per-year iron ore pelletizing plant. Construction of the plant began in 1983 on 1.2 million square meters of land reclaimed from the sea adjacent to the Arab Shipbuilding and Repair Yard. Kobe Steel had the main $207 million construction contract for the plant itself, but ancillary facilities included land reclamation, a deep-water jetty, berths capable of accommodating ships of 100,000 deadweight tons, a 78-megawatt powerplant, a 3,000-cubic-meter-per-day water desalinization plant, and a 135,000-ton-per-year hydrated lime plant. The iron ore was to be imported under long-term contracts, to be negotiated in 1984, and the plant was to produce up to 4 million tons of iron oxide pellets of 11 to 16 millimeters to meet the requirements of both HYL and Midrex direct-reduction processes. The pellets were to be supplied regionally to Iraq, Saudi Arabia, Qatar, and possibly Iran. Production was scheduled to begin in 1984, scaling up to 4 million tons by 1986.

LEBANON

Lebanon's petroleum and mineral sector encountered difficult times in 1983 stemming from continued factional fighting that has disrupted the populace and the economy since the civil war began in 1975. The mineral sector consisted of a small steel industry, three cement plants, gypsum and lime quarries, small-scale production of construction materials, and two petroleum refineries. Very little information was available on the nonfuel mineral industries, although because of the location of the cement plants and the gypsum quarry in northern Lebanon, little damage to these facilities is presumed to have occurred. The petroleum refineries, on the other hand, being considered military targets, were shut down for extended periods owing to the violence.

Lebanon's overall economy, while not collapsing entirely, was plunged into deep recession. Industrial production was estimated to have fallen 80% during 1983, owing to the closure of factories around Beirut and the lack of electricity in other parts of the country. The balance-of-payments deficit was $1.2 billion,[13] the value of the Lebanese pound fell 5% against the U.S. dollar, customs receipts from the ports of Beirut and Tripoli were greatly diminished, and exports were also decreased. In addition, remittances from Lebanese working abroad, which usually stabilized the balance of payments and provided domestic liquidity, all but dried up in 1983 as war-weary civilians increasingly deposited their currency overseas, further weakening the economy.[14]

Lebanon's two petroleum refineries, which ran on imported crude oil, operated intermittently. The Mediterranean Refining Co.'s (Medreco) 17,000-barrel-per-day refinery in Zahrani near Sidon fared considerably better than the Tripoli refinery. The Medreco plant was spared severe damage but remained in Israeli-occupied territory in southern Lebanon. Medreco was owned by Caltex and Mobil Oil Corp. of the United States, and was reportedly operating below capacity although without interference from the Israelis.[15] The Tripoli refinery, owned by the Government, was not nearly as fortunate. The facility had a capacity of 35,000 barrels per day but was closed in November when several units of the refinery, 33 storage tanks, and its pipeline network were destroyed. Cost of the damage was estimated at over $100 million. This left the country reliant on the smaller Zahrani refinery and on imports for its supply of petroleum products. Total imports of crude oil and products were valued at $550 million.

Further exacerbating the country's fuel storage was the decision by the Trans-Arabian Pipeline Co. (TAPLine) to shut down its installations and offices and turn its facilities in the country over to the Lebanese Government. Lebanon had received most of its crude oil through TAPLine, which runs from Saudi Arabia's eastern province oilfields through Jordan and southern Syria to Sidon, Lebanon. Deliveries through TAPLine were halted in 1982 owing to damage to the pipeline. TAPLine facilities in Lebanon included a 4-tanker terminal, 20 storage tanks, and 40 kilometers of the pipeline itself. TAPLine was also closing its facilities in Syria and Jordan. The Lebanese Government was negotiating with Medreco to manage and reopen TAPLine facilities on behalf of Medreco, but no agreement had been reached.

Lebanon's only other direct source of crude oil, the Iraq Petroleum Co. Ltd. pipeline from Kirkuk, Iraq, through Baniyas, Syria, to Tripoli was closed in 1983 by Syria because of its allegiance with Iran in the Persian Gulf war. This left Lebanon dependent on tanker deliveries of crude oil and products, and the result was intermittent shortages of fuel and electricity in the country.

Lebanon's three cement plants; Société des Ciments Libanais, Cimenterie Nationale S.A.L., and Société Libanais des Ciments Blanc, all in Chekka, north of Beirut, had annual capacities of 1.8 million tons, 1 million tons, and 160,000 tons, respectively. Production was estimated to have fallen to 1 million tons or less. A fourth cement plant, Ciments de Sibline, was established in 1983 and was to have started production late in the year. However, with its headquarters in Beirut, it is unlikely that the facility was ever brought into production.

A similar fate was presumed for the country's steel industry, where three plants were responsible for the nation's output. Consolidated Steel Lebanon S.A.L. in Bablos-Amchit, and Lebanon Steel Mill Co. in Tripoli, had capacities of 180,000 tons per year and 100,000 tons per year, respectively. Société Nationale des Tubes S.A.L. also produced galvanized pipe. Steel production was estimated at less than one-half capacity.

OMAN

Oman's petroleum and minerals sector continued to expand in 1983, led by an increase in crude oil production of over 10% and the beginning of commercial production of copper and chromite. Unlike its Persian Gulf neighbors, Oman, which was not a member of OPEC, was able to raise its oil production over 50,000 barrels per day during the year to compensate for the price drop from $34 per barrel to $29 per barrel brought about by OPEC's March 1983 agreement. The result was only a slight drop in oil revenues to the Government, from $3.47 billion[16] in 1982 to $3.2 billion in 1983. Total receipts from petroleum exports were $4.04 billion, down only marginally from $4.10 billion in 1982.

Revenues from oil represent over 96% of total exports value, 80% of Government revenues, and over 55% of the GDP, estimated at $7.3 billion. Real growth in the GDP was estimated at 4%, fairly robust considering the oil price drop, but well below the 21% growth experienced in 1981.[17]

Although Oman's economy remained heavily oil based, the need to diversify led to the establishment of several nonfuel mineral projects. The largest of these was the Sohar copper project, which began shipping refined copper in October from a mine-mill-smelter complex commissioned early in the year. The Oman Mining Co. (OMC), owned by the Government, operated two mines, at Lasail and Bayda, with a third deposit at Aarja scheduled to be developed when reserves at the first two become depleted. Reserves at the three deposits were 8 million, 1 million, and 3 million tons, respectively, all grading between 1% and 2% copper. Output from the two mines at Lasail and Bayda was expected to reach 2,500 tons per day and 1,000 tons per day, respectively, when output reaches full capacity in 1985. The concentrator at the site was capable of producing 250 tons per day of 24% copper concentrates. Output from the concentrator was fed to OMC's 20,000-ton-per-year smelter and electrolytic refinery, which produced 99.97%-pure cathode copper.

In addition to copper, OMC began mining chromite from two areas: one within OMC's copper concession and another north of this area, around Nakhal. Approximately 24,000 tons of chromite had been stockpiled by the end of 1983, with the first shipment of 5,000 tons being exported in December. OMC's chromite production capacity was 20,000 tons per year of untreated chromite ore, grading about 40% Cr_2O_3. Production was halted in December until OMC could find a buyer under a long-term contract.[18] Oman reportedly possessed chromite reserves of 5 to 10 million tons, scattered in over 200 podiform deposits in the northern Oman Mountains.

An intensive geological survey by the Ministry of Petroleum and Minerals also located commercially exploitable reserves of asbestos and coal in the Muswa region around Wasi Fisaw and a large gypsum deposit north of Salalah. The gypsum deposit contained an estimated 2 million tons of recoverable material, and concessions in the area were granted to Oman's two cement companies. The mineral survey was continuing in an effort to locate additional copper reserves and to examine potential gold and silver prospects. Finally, plans were underway evaluating the possibility of establishing a 100,000-ton-per-year steelworks in Oman to be based on imported iron ore, but no decision had been reached by yearend.

In 1983, Oman brought two cement plants into production, the largest being the Oman Cement Co.'s 600,000-ton-per-year dry-process facility located at Rusayl. Also commissioned in the fall was the 210,000-ton-per-year Salalah Cement Works, located between Salalah and Raysut Harbor. Both plants used imported raw materials but were to begin using gypsum quarried from the deposit at Salalah.

Despite the resurgence of the nonfuel mineral sector, industrial development in Oman still centered around the oil industry. The main oil producer in the country was Petroleum Development Oman (PDO), owned 60% by the Government, 34% by Royal Dutch/Shell of the Netherlands, 4% by Compagnie Française des Pétroles (CFP) of France, and 2% by Participations and Explorations Corp. (Partex) of Portugal. PDO produced roughly 97% of the country's output from fields in northern, central, and southern Oman, while the other 3%, about 12,500 barrels per day, was produced by a group composed of Société National Elf-Aquitane Oman (48%) of France, Sumitomo Petroleum Development Co. Ltd. (32%) of Japan, and Wintershall AG (20%) of the Federal Republic of Germany. All of the Elf Group's oil was produced from the Sahmah Field in the Butabul concession on Oman's western border with Saudi Arabia.

PDO's concession ran about two-thirds of the length of the country from northeast to southwest and encompassed every producing field except Sahmah. PDO's oldest fields, in northern Oman, consisted of Fahud, Natih, Lekhwair, Suotan, Qarn-Alam, Yibal, and others. These fields produce roughly 250,000 barrels of oil per day, utilizing gas and water injection to maintain pressure. In 1980, a group of fields in southern Dhofar Province consisting of Rahab, Birba, Marmul, Qaharir, Amal, and Durra-I were bought into production. In 1981-82, the Rima and Jalmud Fields were also brought into production, raising output from the southern fields to over 100,000 barrels per day. All the Dhofar Province fields were connected to the northern fields by a 455-kilometer pipeline from Marmul to Qarn-Alam, which linked up to the main pipeline to Shibkah and then to the export terminal at Mina-al-Fahal.

PDO had other fields near Rima and Jalmud that it was preparing to bring into production to reach its goal of 450,000 barrels per day by 1990. To reach this level in 1983, PDO also instituted a steam-injection secondary recovery project for the Marmul Field. PDO was also very active in exploration, and several new discoveries allowed it to raise the country's proven crude oil reserves to 2.98 billion barrels. PDO discovered oil at Waffrah in northern Oman, at Karim West in southern Oman, and gas at Russaya in northern Oman.

In addition to PDO's discoveries, oil strikes were reported by two foreign consortia during the year. The first was by a joint venture of Gulf Oman Petroleum Ltd. and Occidental Oman Corp., both of the United States, which reported a discovery from its Safah 2X well on the Suneinah concession, 40 kilometers north of the producing Lekhwair Field. Excess capacity in the pipeline linking Lekhwair to Mina-al-Fahal was to be used to transport oil from the new field to the export terminal. Another strike was reported by the Japex Oil Co. and C. Itoh and Co. consortium of Japan at its Mezoun I well on a concession near Wadi Aswad. Other companies that were active in exploration were Amoco Oman Petroleum Co. of the United States; the Elf Group of France together with Sumitomo Petroleum Development Co. of Japan and International Energy Development Corp. of the Netherlands; British Petroleum Ltd. (BP) of the United Kingdom; the Japan Petroleum Development Co., a joint venture of Nippon Oil Co. Ltd. and Teikoku Oil Co. Ltd., both of Japan; and the Adolph Lundun Group of Sweden, which operated a concession offshore Oman.

Most of Oman's oil was marketed under annual contracts, the majority of which were with equity partners in PDO and other Japanese customers. The breakdown of

Oman's oil sales was approximately 160,000 barrels per day to the shareholders in PDO, divided according to equity; 52,000 barrels per day for Japanese customers, including 15,000 barrels per day to C. Itoh (10,000 barrels per day of which is delivered to Idemitsu Oil Co. of Japan), 15,000 barrels per day to Nippon Oil, and 12,000 barrels per day to Kashima Oil Co. of Japan; 40,000 barrels per day above its equity share to Royal Dutch/Shell; 40,000 barrels per day to Transworld Petroleum Co.; 20,000 barrels per day to Mobil; and 50,000 barrels per day for domestic refining. The remainder was sold on the spot market.

The Oman Refinery Co. Ltd.'s 50,000-barrel-per-day refinery completed its first full year of operation in 1983, and production was planned for near capacity in 1984. Construction of the facility was completed in 1982 under a $112 million contract by Mitsui Engineering and Shipbuilding Co. of Japan. The refinery was designed to eliminate Oman's dependence on neighboring Persian Gulf countries for petroleum products.

Oman was just beginning to utilize its natural gas. Most of the country's associated gas was either combined with crude oil in the pipeline to improve flow and raise the quality of the oil, or it was reinjected into oil reservoirs to improve recovery, or flared. About 25% of the country's gas production was nonassociated gas from the Yibal Gasfield in northwest Oman, site of the country's LPG plant. Gas reserves at Yibal were estimated at 2.5 trillion cubic feet. Nonassociated gas from Yibal was used to produce butane, which was sold to the Oman National Gas Co. for bottling and domestic use; propane, which was also sold domestically; and natural gasoline, which was used to upgrade crude oil in the pipeline to Mina-al-Fahal. Gas from Yibal was also pumped through the 345-kilometer Yibal to Muscat pipeline to provide all the power generating requirements of the capital. A spur of this line delivered gas to OMC's copper project at Sohar, providing all the power requirements of the copper industry. To handle the increase in gas production and consumption, the Yibal gas plant was being expanded from 125 million cubic feet per day capacity to 320 million cubic feet per day under a contract to a Netherlands-Japanese consortium.

Table 2.—Oman: Exports and reexports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Iron and steel: Metal, semimanufactures:				
Bars, rods, angles, shapes, sections	456	583	--	United Arab Emirates 450; Saudi Arabia 123.
Universals, plates, sheets	196	88	--	United Arab Emirates 67; Qatar 19.
Wire	34	35	--	All to United Arab Emirates.
Tubes, pipes, fittings	2,366	168	--	United Arab Emirates 166.
Other: Base metals including alloys, all forms	5,588	1,238	--	Pakistan 860; United Arab Emirates 343.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc value	$2,000	$4,000	$4,000	
Grinding and polishing wheels and stones	30	700	--	All to United Arab Emirates.
Cement	167	2,302	--	Do.
Fertilizer materials:				
Crude, n.e.s	--	240	--	Do.
Manufactured: Nitrogenous	--	106	--	Do.
Lime	220	131	--	Do.
Salt and brine	70	--		
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	649	7	--	Do.
Worked	--	279	--	Do.
Gravel and crushed rock	52	5,469	--	United Arab Emirates 5,269; Bahrain 199.
Limestone other than dimension	8,610	3,109	--	All to United Arab Emirates.
Sand other than metal-bearing	--	7,683	--	United Arab Emirates 7,583; Qatar 66.
Other: Crude	--	769	--	United Arab Emirates 768.

See footnote at end of table.

Table 2.—Oman: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	58	441	--	United Arab Emirates 429.
Distillate fuel oil do.	336	--		
Lubricants do.	1,932	2,128	--	All to United Arab Emirates.

[1] Table prepared by Virginia A. Woodson.

Table 3.—Oman: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Unwrought and semimanufactures	1,559	1,574	20	Belgium-Luxembourg 264; United Arab Emirates 207; Thailand 200.
Copper: Metal including alloys, semimanufactures	378	233	14	United Kingdom 114; Japan 50; India 13.
Iron and steel: Metal:				
Pig iron, cast iron, related materials	675	12	--	Mainly from United Arab Emirates.
Steel, primary forms	579	184	--	Japan 119; United Kingdom 64.
Semimanufactures	191,652	261,352	2,478	Japan 189,713; United Arab Emirates 29,389; France 7,575.
Lead: Metal including alloys, unwrought	240	51	--	Italy 38; United Kingdom 6.
Nickel: Metal including alloys, unwrought and semimanufactures	12	55	(2)	India 38; United Kingdom 14.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$229	$40	--	United Arab Emirates $35; United Kingdom $3.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	200	209	1	Italy 173; Switzerland 10; West Germany 7.
Cement thousand tons	834	1,004	--	United Arab Emirates 334; Kenya 164; Japan 161.
Diamond: Gem, not set or strung value, thousands	$36	$110	$1	Spain $93; United Kingdom $14.
Fertilizer materials: Manufactured	11,658	3,982	37	United Arab Emirates 960; Belgium-Luxembourg 488.
Gypsum and plaster	105	290	--	United Arab Emirates 203; United Kingdom 87.
Lime	3,507	2,504	--	United Arab Emirates 2,118; Belgium-Luxembourg 280.
Salt and brine	7,042	8,883	19	Netherlands 5,516; Belgium-Luxembourg 1,250; China 1,065.
Stone, sand and gravel:				
Dimension stone	2,792	2,890	--	United Arab Emirates 1,342; Italy 1,049.
Gravel and crushed rock	26	423	--	Italy 374; India 31; United Arab Emirates 18.
Limestone other than dimension	668	1,587	3	Belgium-Luxembourg 900; India 630.
Sand other than metal-bearing	359	844	469	United Arab Emirates 311; India 30; Norway 14.
Other: Crude	15,618	16,301	137	United Arab Emirates 5,070; United Kingdom 3,829; Thailand 3,127.
MINERAL FUELS AND RELATED MATERIALS				
Coal: All grades including briquets	89	157	--	Sri Lanka 92; India 39; United Arab Emirates 26.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	108	170	--	United Arab Emirates 169.

See footnotes at end of table.

Table 3.—Oman: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products —Continued				
Gasoline thousand 42-gallon barrels	1,794	1,963	--	Bahrain 1,398; France 239; Singapore 97.
Kerosine and jet fuel do	915	1,104	(2)	Bahrain 820; United Arab Emirates 222.
Distillate fuel oil do	1,948	1,936	--	Bahrain 1,246; Kuwait 284; United Arab Emirates 157.
Lubricants do	143	184	6	Singapore 50; United Kingdom 36; Spain 33.
Residual fuel oil do	60	60	(2)	United Kingdom 33; United Arab Emirates 27.
Bituminous mixtures do	608	135	(2)	Bahrain 111; Spain 21.

[1] Table prepared by Virginia A. Woodson.
[2] Less than 1/2 unit.

QATAR

Like most of its oil producing neighbors, Qatar's predominantly oil-based economy was adversely affected by the $5 per barrel cut in crude oil prices in March. Despite diversification of its industrial sector into production of fertilizer, petrochemicals, and iron and steel, these industries still accounted for less than 10% of the GDP, estimated at $8.2 billion.[19] Prior to 1983, petroleum accounted for 94% of export earnings, 80% of Government revenues, and over 70% of the GDP, but this contribution has fallen dramatically owing to lower oil prices and reduced levels of production. Crude oil output fell from an alltime high of 570,000 barrels per day in 1973, and just over 500,000 barrels per day in 1980, to 171,000 barrels per day in March 1983. The result was a 30% reduction in budgeted capital expenditures for fiscal year 1983-84, with no new development projects beginning during that period, and a $1 billion budget deficit. Petroleum revenues from exports of crude oil and liquefied gas amounted to $2.99 billion, down 46% from that of 1981. Imports reached only $1.5 billion, and together with aid payments to other Arab countries, resulted in a current account surplus of only $410 million, down from $2.4 billion in 1981.

Despite the gloomy revenue picture, Qatar was among the most fortunate of the Arab Gulf States by virtue of its ownership of one of the largest undeveloped natural gas deposits in the world, the North Field. The presence of this field, while ensuring Qatar's future as an energy supplier for close to 100 years, was presenting some immediate problems. Because of low oil production, Qatar's gas output was also below its domestic requirement for feedstock to fuel its industries. Qatar needed to tap the North Field immediately to satisfy its domestic demand. Economics of scale, however, dictated that the country should tap the field for domestic use only in conjunction with a larger export-oriented liquefied gas project, which was not a profitable venture under existing market conditions. The need for the gas domestically eventually prevailed, and an agreement to develop the field on a large scale was initiated late in the year.

Output of crude oil ranged from 171,000 barrels per day in March, to over 400,000 barrels per day late in the year. Average production was just under 280,000 barrels per day, considerably below its OPEC quota of 300,000 barrels per day. Qatar's crude oil came from five oilfields: the onshore Dukhan Field, which produced roughly 50% of the country's oil; the three offshore fields, Idd al-Shargi, Bul Hanine, and Maydan-Mahzam; and the offshore Bunduq Field, which resumed production in December after being shutdown for 4 years for installation of a $330 million water injection system. The Bunduq Field was shared evenly by Qatar and Abu Dhabi, but its production was included only in the United Arab Emirates production quota. Crude oil reserves in the Dukhan Field were estimated at 2.4 billion barrels, just slightly larger than the 2.2 billion barrel reserves in the three offshore fields.

The Qatar General Petroleum Corp. (QGPC), owned by the Government, controlled the country's oil industry from exploration, production, refining, and marketing, to fertilizer and petrochemical manufacturing. The oilfields were operated under contracts to service companies; the Dukhan Service Co., a joint venture of Royal Dutch/Shell, BP, CFP, Mobil, Exxon Corp. (United States), and Partex, operated the Dukhan Field; and the Shell Service Co., a subsidiary of Shell International Petroleum Maatschappij of the Netherlands, operated the offshore fields. The service companies were paid about 22 cents per barrel of oil produced, and the reduced output resulted in sharply lower revenues for the companies in 1983.

These service company operators also had contracts with QGPC for buying over 50% of the country's oil output, with Shell taking the largest share, about 30,000 barrels per day. BP was committed to at least 15,000 barrels per day. Qatar's other major customers were Japanese companies, among them Idemitsu for 10,000 barrels per day, Mitsubishi Corp. for 15,000 barrels per day, Mitsui and Maruzen Oil Co. for 5,000 barrels per day each; and finally Brazil's Petróleo Brasileiro S.A. (PETROBRÁS) for 15,000 barrels per day. Approximately 12,000 barrels per day was used in domestic refining, with the remainder sold on the spot market or used in lieu of currency to pay debts for project development.

The National Oil Distribution Co., QGPC's refining subsidiary, brought a new 50,000-barrel-per-day oil refinery on-stream in October. The new facility, built at a cost of $137 million by Technip of France, was to be integrated with Qatar's existing 12,000-barrel-per-day refinery at Umm Said. The combined capacity of 62,000 barrels per day of refined products was more than enough to satisfy domestic consumption of 20,000 barrels per day, while providing a substantial surplus for export. Throughout 1983, Qatar had imported 40% of its refined product requirements from Bahrain at a cost of $100 million.[20]

Qatar produced both associated and nonassociated gas in 1983, although neither at a rate sufficient to satisfy domestic demand. Of the total gas production, 155 million cubic feet per day was associated gas produced onshore from the Dukhan Field, 84 million cubic feet per day was associated gas from the offshore fields, and 313 million cubic feet per day was nonassociated gas from the Khuff Formation reservoir onshore beneath the oil producing Dukhan Formation. Total gas demand in Qatar was estimated at 800 million cubic feet per day, which would accommodate full utilization of the two export-oriented NGL plants (NGL I and NGL II), the petrochemical and fertilizer plants, the steel mill, and the power generating and water desalinization plants. NGL I, which utilized gas produced onshore, and NGL II, which used offshore associated gas, operated well below capacity in 1983, producing a total of 305,474 tons of propane, 215,932 tons of butane, and 183,626 tons of condensate. This was an average of 30% more than in 1982, however, when the pipeline carrying gas to the plants from the offshore fields was blocked by sediment. Royal Dutch/Shell replaced the gas pipeline in 1983, and agreed to replace a similar crude oil line that encountered the same problem. NGL I and II were wholly owned by the Qatari Government.[21]

The major gas-related development in 1983, however, was the Government's decision to proceed with exploitation of the North Field, where proven reserves of nonassociated gas were raised to 150 trillion cubic feet, with twice that amount listed as possible resources. Late in 1983, QGPC signed a preliminary agreement with BP and CFP for a $6 billion venture to produce the gas, bring it onshore both for use domestically, and to produce almost 200,000 barrels per day of liquefied natural gas (LNG) for export. The field, in full operation, was to produce 2 billion cubic feet per day of gas, 1.2 billion cubic feet per day of which was to go to the LNG plant, which was to be capable of producing 50,000 to 70,000 barrels per day of condensate, 120,000 barrels per day of NGL, and 40,000 tons per year of sulfur. The remaining 800 million cubic feet of gas would be earmarked for domestic consumption in the existing NGL plants (NGL I and II), and other domestic industries. BP and CFP were each to have 7.5% of the equity in the export-oriented LNG plant, with another 15% to be reserved for a company that would handle marketing of the output. The project, construction of which was expected to start in 1985, was to be operational by 1992. It was to be financed 100% by Qatar.[22]

One of the major gas consuming industries in Qatar was the Qatar Petrochemical

Co. (QAPCO) plant at Umm Said. QAPCO, a joint venture of QGPC (84%) and Charbonnages de France-Chimie (CDF-Chimie) (16%), produced ethylene, low-density polyethylene, and sulfur from ethane-rich gas feedstock provided by NGL I and II. QAPCO awarded CDF-Chimie a $55 million contract to design, supply, and install an ethane recovery turboexpander plant at Umm Said to increase ethane feedstock from 600 to 1,100 tons per day. The new unit was designed to insulate QAPCO from feedstock shortages, which occurred when oil production dropped below 400,000 barrels per day, as was the case throughout 1983. Ethylene production in 1983 was 164,000 tons, only 58% of capacity, owing to the feedstock shortage. All ethylene production was used to produce low-density polyethylene, all of which was marketed by CDF-Chimie under a 10-year agreement.

The Qatar Fertilizer Co. (QAFCO), owned 75% by QGPC and 25% by Norsk Hydro A/S of Norway, was one of the few industries not affected by the gas shortage. While designed to run on associated gas from Dukhan, the plant was able to utilize almost 50% Khuff gas in 1983 to make up for the shortfall. The result was a record-high output of 586,000 tons of ammonia and 685,000 tons of urea, 100% of design capacity. The main customers for ammonia and urea were India, China, and the Philippines. QAFCO made a $16 million profit in 1983.[23]

The Qatar Steel Co. (QASCO) also received its full requirement of fuel gas in 1983, allowing it to produce 477,000 tons of raw steel, over 100% of design capacity. QASCO was owned 70% by the Qatari Government, 20% by Kobe Steel, and 10% by Tokyo Boeki, both of Japan. QASCO operated a 900,000-ton-per-year Midrex direct-reduction iron plant, feeding two 70-ton electric arc furnaces, two 4-strand continuous billet casters, and a 20-strand bar mill with a design capacity of 440,000 tons per year of semifinished steel. QASCO's output was sold 44% to Saudi Arabia, unspecified amounts to Iraq and the United Arab Emirates, and 13% was consumed domestically. Kobe Steel acted as plant manager under a contract due to expire in 1986, and Tokyo Boeki was the sole marketing agent. Because of the low international price for the steel, QASCO failed to make a profit in 1983.

The Qatar National Cement Co. (QNCC) operated the country's only cement plant, a 900-ton-per-day facility at Umm Bab. QNCC was owned 43% by the Government and 57% by private Qatari shareholders. QNCC quarried its own gypsum, lime, and clay from a concession area near the plant. The three-kiln facility operated at 75% of capacity during the year. In addition to these minerals used in cement production, a recent geological survey in Qatar indicated the presence of manganese, marble, and salt, along with additional deposits of limestone and gypsum. Preliminary investigations into exploiting these minerals were underway during the year.

SYRIA

Syria was adjusting to a lower level of economic growth in 1983, resulting from weakened commodity and mineral exports, a large trade imbalance, reduced aid payments from its Arab neighbors, and a costly defense program. Production of most mineral products remained the same or declined from that of 1982, with the notable exception of oil and gas, which increased for the first time in 8 years. Production of Syria's most important nonfuel mineral commodity, phosphate, was at its lowest level in 5 years. This enlarged the country's trade deficit and reduced its receipts of much-needed foreign exchange. Real GDP, in 1980 prices, was estimated at $16.75 billion,[24] only modestly above the 1982 level. The petroleum and mineral industry together accounted for less than 8% of the gross national product (GNP), but remained important because of their currency earning potential.

Petroleum production increased over 10% in 1983, although the approximately $60 million revenue increase that resulted was more than offset by roughly $74 million in higher production cost, from the country's aging oilfields. Petroleum continued to account for about 45% of the country's total export revenues, estimated at $2.2 billion in 1983. Syria had six producing oilfields: Suweidiyah, Karatchok, Rumeilan, Hamza, Jubaisseh, and Al-Hayane, all of which were in northeastern Syria. Suweidiyah was by far the largest, producing roughly 90% of the country's oil and containing reserves in excess of 1 billion barrels. Syria's proven recoverable crude oil reserves were placed at 1.575 billion barrels, with an average API gravity of 23°. Jubaisseh, one of the newer oilfields, having started production in 1975, was the only producer of high gravity oil. Output from the field in 1983 was about 12,350 barrels per day of 40° API oil, compared with an average API gravity of 22.5° for the other five fields.[25]

The Syrian Petroleum Co. (SPC), owned by the Government, was the only producer of crude oil, but foreign companies remained active in exploration. Marathon Oil Co. of the United States discovered nonassociated gas from its second well on a 15,500-square-kilometer concession 200 kilometers northeast of Damascus. This was the first commercial hydrocarbon discovery to be made by a foreign concessionaire, and the first discovery in Syria since 1977. Still exploring for oil and gas in 1983 were the Syrian-American Oil Co., a subsidiary of Coastal States Corp. of the United States, Pecten Syria Co., and a 50-50 joint venture of Shell International and Shell Oil Co. of the United States and Challenger Desert Oil Co. (Chadoil) of Panama. Pecten Syria was exploring a 22,000-square-kilometer concession near Palmyra, while Chadoil was in the third year of a 4-year exploration and production-sharing agreement on a 27,353-square-kilometer concession in the same area.

SPC dominated exploration activity, however, by drilling an estimated 230,000 feet in exploratory wells in the Lattakia, Deir el-Zor, and Aleppo areas. SPC was planning to drill 45 wildcat wells and keep 2 seismic crews working in the Homs and Akkar regions in 1984. Pecten Syria was also drilling in Deir el-Zor.[26]

With crude oil reserves dwindling and the heavy oil requiring increasingly expensive secondary recovery techniques, natural gas was gaining importance as an energy resource. Gas reserves in the country were estimated at 1.29 trillion cubic feet. Because all current production was associated gas that increased or decreased with crude oil output, gas production was up in 1983 to an average of 170 million cubic feet per day, only 26% of which was collected and used domestically. A gas gathering and treatment system was in place in the Suweidiyah Field, which processes 28 million cubic feet of associated gas per day to produce 125 tons per day of LPG. The system includes 60 kilometers of pipeline, desulfurization units, and a cracking plant to produce LPG, solvents, and natural gasoline. A second gas gathering plant was under construction at Hasakah, designed to process up to 90 million cubic feet per day of nonassociated gas. This plant was to use gas from fields near the Marathon discovery in northeast Syria, once brought on-stream. The gas plant was to be linked by pipeline to the ammonia-urea plant at Homs to provide feedstock for ammonia production. The plant was using naphtha feedstock.

Syria's two refineries, at Homs and Baniyas, supplied nearly all of the domestic demand for petroleum products while providing some surplus fuel oil for export, although neither operated at the rated capacity of 102,000 barrels per day and 126,000 barrels per day, respectively. The Homs plant, after being modernized in 1979, supplied most of the domestic needs, while output from Baniyas, brought on-stream in 1981, provided fuel oil and some jet fuel and gasoline for export. Both refineries processed a mix of domestic heavy crude and imported Iranian light crude, with a 1:1 ratio at Homs and a 1:4 ratio at Baniyas.

About 40% of Syria's domestically produced oil is exported. Most of it is blended with lighter Algerian or Libyan crude before being refined in Western Europe and, to a lesser extent, Eastern Europe. About 35% of Syria's refined products were exported. On the other hand, Syria imported crude oil under a special contract with Iran at the rate of 120,000 barrels per day on concessionary terms, 20,000 barrels per day of which was supplied to the Syrian Army without charge. This gesture by Iran was in response to Syria's closing the Kirkuk-Baniyas pipeline from Iraq in 1982, thereby denying Iraq, Iran's adversary in the Persian Gulf war, an important export outlet for its oil. The Kirkuk-to-Baniyas pipeline was transporting up to 400,000 barrels per day of Iraqi crude when it was closed in April 1982.[27]

Associated with Syria's petroleum refining industry were two ammonia-urea fertilizer plants at Homs that utilized naphtha feedstock. The plants, one with an annual capacity of 110,000 tons per year of nitrogen fertilizer, and the other capable of producing 365,000 tons each of ammonia and urea, were operated by the state-owned General Establishment of Chemical Industries.

Syria's largest nonfuel mineral product was phosphate rock. The phosphate industry accounted for roughly 5.5% of all nonfuel export earnings and ranked behind only oil, cotton, and agricultural products in terms of value. Phosphate rock output fell 16% in 1983, owing mainly to weak worldwide demand. Production was from two areas, Al Shargiya and Khneifiss, both in the Palmyra district, 160 kilometers southwest of Homs. Production capacity from the two areas was 1 million tons per year of 58% to 62% bone phosphate of lime (BPL) content, and 500,000 tons of 52% to 63% BPL ore, respectively. Total phosphate rock reserves in the country were estimated at 65 million tons of recoverable ore containing 59% to 61% BPL. Syrian phosphate was exported as beneficiated ore from the Port of Tartous, which was capable of handling up to 1.5 million tons of phosphate per year. Exports went mainly to Eastern Europe, with Romania receiving the largest share, followed by Czechoslovakia and Bulgaria. China also imported Syrian phosphate.

Syria's phosphate fertilizer complex at Homs completed its second full year of operation in 1983. Approximately 450,000 tons of phosphate rock was delivered to the plant, which was designed to produce 150,000 tons of phosphoric acid and 450,000 tons of triple superphosphate annually. The plant operated at an estimated 50% of capacity during the year.

Syria continued to invest heavily in building new cement plants to satisfy domestic requirements. There were five cement plants operating in the country: at Adra, Aleppo, Dummar, Hama, and Tartous, with two others being planned for Hasakah and Lattakia. The third production line at the Adra plant, completed in 1982, commenced production late in the year, and the fourth line at the 2.3 million-ton-per-year Tartous plant was to start production in 1984, raising total cement capacity to 4.5 million tons per year. The plants at Aleppo, Dummar, and Hama were fully operational in 1983. Syria's cement demand was between 3.5 million and 4 million tons per year, and if all existing plants were to produce at rated capacity, Syria would switch from being a net importer to a net exporter of cement by 1985.

Syria did not produce any raw metals in 1982, and its only metal industry was the General Co. for Iron and Steel Products' (Gecosteel) 120,000-ton-per-year electric arc steel plant and bar mill at Hama. The plant produced steel billets, merchant bars, and galvanized and welded pipe, all from imported direct reduced iron and steel scrap. Gecosteel, owned by the Government, was planning to increase the capacity of its rod mill to 200,000 tons per year and at the same time expand capacity of the welded pipe plant to 20,000 tons per year. Several foreign companies were preparing studies on expanding the plant, and a contract was expected to be awarded in 1984.

PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN

Development of the mineral resources of the People's Democratic Republic of Yemen (PDRY), especially petroleum production and refining, remained a top priority of the Government in 1983. The mineral industry consisted only of salt produced from seawater and refining of imported oil at an old refinery at the Port of Aden, which was once one of the world's largest oil bunkering facilities. Petroleum still held the key to future prosperity in Yemen, as testing continued on the country's first oil discovery and plans were being laid to modernize and expand the Aden refinery.

PDRY's economy made limited progress in 1983, with the GNP reaching $1.15 billion,[28] a 5% increase in real terms from that of 1982. Although the economy was predominantly based on agriculture, industrial projects received the bulk of investment in 1983, followed by rural electrification, agriculture, and mineral exploration. Industry, mostly small-scale manufacturing and construction, contributed approximately 21% of the GNP in 1983.

To stimulate future growth in the economy, the Government focused on developing the petroleum industry by encouraging foreign companies to explore for and develop oil resources through joint venture or production sharing formulas. The most prominent of these was with Azienda Generali Italiana Petroli S.p.A. (AGIP) of Italy, which signed the first production sharing agreement with PDRY in 1977 for two offshore blocks at Ghayda and Sayhut. In 1979, AGIP also acquired the Mukalla block, covering onshore and offshore areas. In April 1982, after drilling six wells in the Sayhut and Mukalla block, AGIP struck oil in its Sharmah 1-X wildcat in 140 meters of water in the Sayhut block, 11 kilometers off the Hadhramaut coast. The well tested at 3,000 barrels per day of 43° API crude from 2,200 meters depth. In April 1983, AGIP relinquished the Ghayda block along with parts of Sayhut and Mukalla, and added some onshore areas around Sayhut for a total of 5,000 square kilometers of concession area. AGIP spent most of 1983 testing the underground structure and drilling additional appraisal wells. No date was available for commencement of commercial production.

Braspetro, the international subsidiary of the Brazilian state oil company PETROBRÁS, was operator of an onshore concession shared 20% with Spain's Hispánica de Petróleos S.A. in the 42,000-square-kilometer Haurin Ghayda block in eastern PDRY. Braspetro had completed seismic lines totaling 1,170 kilometers and was to begin drilling no later than 1984 under a 4-year agreement signed in 1981.

The privately owned Independent Petroleum Group (IPG) of Kuwait was active in both oil exploration and in rehabilitating the Aden refinery. IPG signed an exploration agreement in June for a 13,000-square-kilometer concession in the Balhalf region, both onshore and offshore between Aden and Mukalla. The agreement calls for seismic work and well drilling within 3 years.[29]

The Soviet Union's Technoexport, active in other sectors of PDRY's economy, was also working under contract to PDRY's Petroleum and Minerals Board to conduct onshore seismic surveys and drill two wells in Hadhramaut and Shawbah Provinces.[30] The International Bank for Reconstruction and Development (World Bank) had also financed seismic work under a $9 million loan granted in 1980. Seismic crews had completed 220,000 kilometers of line surveys by 1983. Data was to be made available to companies interested in joining the oil search in PDRY.

The Aden refinery remained the centerpoint of PDRY's industrialization efforts. The facility was built by BP in 1954, and remained under BP's control until nationalized in 1977. The refinery was composed of two simple distillation units each with 85,000 barrels per day throughput capacity. Average throughput for the past 5 years was 25.55 million barrels of crude oil, with 1983 throughput reaching 27.75 million barrels. Oil was processed on behalf of third-party customers in roughly the following breakdown: 3.65 million barrels per year purchased for local consumption, 3.65 million barrels per year for Kuwait, 2.95 million barrels per year for the U.S.S.R., and 17.5 million barrels per year for Iran. The refinery generated income for PDRY of approximately $25 million per year, and with its associated facilities, provided employment for 20,000 people.[31]

Kuwait's IPG was acting as management consultant for the refinery modernization project and had commissioned Bechtel United Kingdom to do a detailed engineering and procurement study. The modernization plan included installation of a 10,000-barrel-per-day vacuum distillation unit to process fuel oil, adding a 100,000-ton-per-year asphalt plant, raising LPG production capacity from 230,000 to 700,000 barrels per year, and pressurization facilities for LPG to allow for short-haul shipping. The expansion project was geared toward making the refinery's output more suitable to the regional market. Six firms were selected to bid on the project, which was expected to cost $30 million and be completed by late 1985. No contractor had been selected at yearend.

Nonfuel mineral development remained of secondary importance to the PDRY Government. The Public Salt Organization was installing new automatic packaging lines at its marine salt evaporation ponds at Khawr Maksoir. The plant produced between 50,000 and 75,000 tons per year. The Government was still conducting feasibility studies on constructing a cement plant at Batays. A consultant was retained to perform engineering studies and site selection, and bidding was scheduled to begin sometime in 1984.

YEMEN ARAB REPUBLIC

The Yemen Arab Republic (YAR) remained one of the world's 10 least-developed nations, with an economy based heavily on agriculture that was still recovering from a devastating earthquake that struck the northern Dhamar Province in December 1982, causing upwards of $1 billion in damage to an economy with a GDP of $1.6 billion[32] (1975 prices). The country's mineral industry consisted of the production of rock salt, gypsum, and cement, and the exploration for petroleum resources. Small-scale copper mining may also be underway, with Romanian assistance, although no production was reported.

The YAR derives most of its income from remittances from its nearly 1 million nationals working abroad. These remittances were estimated at $1.1 billion in 1983, and combined with aid from Arab neighbors, made up the bulk of the national income. YAR was the most populous nation on the

Arabian Peninsula, and combined imports for consumption totaled $1.9 billion, while exports, consisting of food and mineral products, earned only $5 million. With limited capital available within the country and agriculture continuing to receive most of the public investment, development of the country's mineral resources, which include copper, lead, zinc, nickel, iron, cobalt, and gypsum, was moving slowly at best.

Like that of its southern neighbor the People's Democratic Republic of Yemen, petroleum exploration continued to hold promise for improving the standard of living. Shell Oil Co. of the United States performed initial seismic work on the Tihama coastal plain in the early 1980's. Since then, the Yemen Hunt Oil Co., a subsidiary of Hunt Oil Co. of the United States, also completed seismic surveys on its 4,865-square-kilometer concession in northeastern YAR, and was evaluating its data. Most recently, BP signed a production sharing agreement with YAR's National Oil Co. for exploration of a 22,000-square-kilometer concession extending from Hodeida to the Saudi border on the Tihama plain. Seismic work was to be completed by June 1986, after which time drilling would begin or the concession was to be relinquished. YAR's petroleum law allowed for a 55% tax rate and 12.5% royalty on petroleum concessions, making it relatively attractive should oil be discovered.

In addition to petroleum exploration, the World Bank's International Development Agency was providing a $13 million credit for a geothermal energy exploration project. The project was to include drilling four test wells to a depth of 2,000 meters, technical assistance, consultancy service, and staff training. The drilling was to take place in the Dhaman Rada'a area, where significant geothermal potential was thought to exist. The project was to be completed in September 1986. YAR was providing $2.35 million of the financing.

Until new energy sources are developed, YAR will continue to rely on imported petroleum products. YAR imported approximately 3 million barrels of gasoline and fuel from Kuwait in 1983, with another 800,000 barrels of unspecified fuel brought in unofficially across the country's northern border. To assist in importing and distributing petroleum products around the country, a 278-kilometer products pipeline was being constructed to carry products from the Port of Salif to Ma'bar and then to Sanaa. It was to traverse elevations from sea level to 2,800 meters through rugged, mountainous terrain. Tank farms for product storage were to be built at Sanaa and Salif, and another distribution pipeline was to be built from Mocha to Taiz, covering 106 kilometers. Both lines were under construction by Omnium Technique des Transports par Pipelines of France under a $150 million contract awarded in 1981. Both lines were to be completed late in 1984.

In the nonfuel sector, cement, gypsum, and salt were the only products that were known to have been produced, although significant discoveries of marble in Taiz, Rada'a, and Hajjah may signal the beginning of a new industry. Rock salt and gypsum were mined at the Port of Salif by the Yemen Salt Mining Corp. Most of the salt was exported, while gypsum was consumed domestically in the cement industry. There were two operating cement plants in YAR, one located at Banjil near Hodeida, which was expanded from 80,000 tons per year to 300,000 tons per year capacity with Soviet assistance in 1982. A second plant, at Amran, 50 kilometers north of Sanaa, was completed early in 1983 by Ishikawajima-Harima Heavy Industries Co. Ltd. and Nissho-Iwai Corp., both of Japan. The 500,000-ton-per-year plant cost $110 million, and produced at almost 70% of capacity during the year. Marble deposits, discovered during a geological survey financed by the Industrial Bank of Yemen, were being evaluated by an Italian company. The company was considering building quarries and processing plants at each site, at a cost of between $2 and $2.5 million each.

Except for the possible small-scale copper mining, no metal deposits were worked in 1983. Several deposits had been identified, including a silver-lead-zinc deposit near an ancient silver mine at Jabali, 75 kilometers northwest of Sanaa. It had been discovered by the French Bureau de Recherches Géologiques et Minières (BRGM) in 1980. Also identified was a deposit containing copper, nickel, cobalt, and iron, in 10 to 15 million tons of ore near Al-Hamoura, 295 kilometers south of Sanaa. No plans existed to develop these deposits, but the BRGM was continuing its geological assessment of the country, seeking to locate more commercially attractive deposits in 1983.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Afghanistan afghanis (Af) to U.S. dollars at the rate of Af50.6=US$1.00.

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[3] U.S. Embassy, Peshawar, Pakistan. Report on Uranium Export from Afghanistan. State Dep. Telegram 0058, Jan. 1984.

[4] Mining Journal (London). Nov. 11, 1983, pp. 341-342.

[5] Page 342 of work cited in footnote 4.

[6] Work cited in footnote 3.

[7] Where necessary, values have been converted from Bahraini dinars (BD) to U.S. dollars at the rate of BD0.376=US$1.00.

[8] Financial Times (London). Survey "Bahrain." May 8, 1984, p. 7.

[9] Arab Petroleum Research Center (Paris). Arab Oil and Gas Directory 1984. P. 74.

[10] Middle East Economic Survey. V. 27, No. 4, Nov. 7, 1983, p. A4.

[11] Page 8 of work cited in footnote 8.

[12] U.S. Department of Commerce, International Trade Administration. Foreign Economic Trends and Their Implications for the United States. Bahrain. FET 84-38, Mar. 1984, p. 5.

[13] Where necessary, values have been converted from Lebanese pounds (LL) to U.S. dollars at the rate of LL4.53=US$1.00.

[14] Al-Qabas (Kuwait). Dramatic Drops in Production, Exports, Value of Pound Cited. Oct. 20, 1983, p. 20.

[15] Middle East Economic Survey. V. 27, No. 22, Mar. 12, 1984, p. A7.

[16] Where necessary, values have been converted from Omani riyals (ORls) to U.S. dollars at the rate of ORls0.345=US$1.00.

[17] Financial Times (London). Survey "Oman." Mar. 13, 1983, p. 2.

[18] U.S. Embassy, Muscat, Oman. Oman Ships First Consignment of Chromite. State Dep. Telegram 5377, Dec. 1983.

[19] Where necessary, values have been converted from Qatari riyals (QRls) to U.S. dollars at the rate of QRls0.275=US$1.00.

[20] Middle East Economic Survey. V. 27, No. 20, Feb. 1984, p. A8.

[21] Dalby, S. Survey "Qatar." Financial Times (London), July 6, 1984, p. 2.

[22] Middle East Economic Survey. V. 27, No. 25, Apr. 1984, p. A5.

[23] Work cited in footnote 21.

[24] Where necessary, values have been converted from Syrian pounds (£Syr) to U.S. dollars at the rate of £Syr3.90=US$1.00.

[25] Page 358 of work cited in footnote 9.

[26] Oil and Gas Journal. V. 81, No. 1, Jan. 2, 1984, p. 31.

[27] Middle East Economic Survey. V. 26, No. 43, Aug. 8, 1983, p. A3.

[28] Where necessary, values have been converted from Yemeni dinars (SYD) to U.S. dollars at the rate of SYD0.345=US$1.00.

[29] Khadduri, W. Oil Prospects in South Yemen. Middle East Economic Surv., v. 27, No. 17, Feb. 6, 1984, pp. D1-D7.

[30] Oil and Gas Journal. V. 81, No. 41, Oct. 10, 1983, p. 126.

[31] Page 26 of work cited in footnote 29.

[32] Where necessary, values have been converted from Yemeni rials (YRls) to U.S. dollars at the of YRls4.585=US$1.00.

Table 4.—Yemen Arab Republic: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1980	1981	Sources, 1981	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Scrap	172	([2])	--	Mainly from France.
Semimanufactures value, thousands	$3,660	$4,670	$7	Greece $1,239; China $811; Italy $618.
Copper: Metal including alloys, semimanufactures do.	$282	$43	--	China $20; Saudi Arabia $6; Sweden $6.
Iron and steel: Metal:				
Scrap	2,160	--		
Pig iron, cast iron, related materials	[3]2,096	1,249	--	China 1,013; U.S.S.R. 95.
Steel, primary forms	1,244	238	--	Japan 229.
Semimanufactures:				
Bars, rods, angles, shapes, sections	NA	78,907	--	Japan 33,907; China 20,829; Italy 2,514.
Universals, plates, sheets	NA	28,439	2	Japan 13,456; Italy 3,461; China 2,224.
Rails and accessories value, thousands	$59	$127	--	Japan $101; India $14.
Wire do.	$1,218	$210	--	China $70; Denmark $31; Netherlands $25.
Tubes, pipes, fittings do.	$48,118	$9,899	$690	Saudi Arabia $1,623; India $1,379; Italy $1,204.
Castings and forgings, rough do.	$3,509	$1,801	--	India $431; Japan $414; Netherlands $329.
Lead:				
Oxides	--	50	--	Netherlands 34; Republic of Korea 16.
Metal including alloys, semimanufactures value, thousands	$23	$6	--	Saudi Arabia $5.
Nickel: Metal including alloys, semimanufactures do.	$51	$9	NA	West Germany $4.
Rare-earth metals including alloys, all forms	--	53	--	Netherlands 51.
Zinc: Metal including alloys:				
Scrap	2	15	--	All from Saudi Arabia.
Semimanufactures value, thousands	$1,787	$2,762	--	Japan $1,353; Saudi Arabia $239.

See footnotes at end of table.

Table 4.—Yemen Arab Republic: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1980	1981	Sources, 1981	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones value, thousands	$171	$155	--	Denmark $55; China $32; West Germany $14.
Cement	NA	658,497	--	Greece 515,234; U.S.S.R. 41,943; China 25,543.
Diatomite and other infusorial earth	22	93	--	Saudi Arabia 87.
Fertilizer materials: Manufactured:				
Nitrogenous	NA	23,367	--	Saudi Arabia 22,227; West Germany 797.
Phosphatic	NA	735	--	Saudi Arabia 478; Djibouti 209.
Potassic	NA	98	--	West Germany 94.
Unspecified	NA	577	--	Saudi Arabia 402; United Kingdom 173.
Gypsum and plaster	179	227	--	Saudi Arabia 209; Italy 9.
Lime	NA	1,295	--	Saudi Arabia 794; China 250.
Salt and brine	--	2,335	--	Yemen (Aden) 425; Saudi Arabia 42; unspecified 1,784.
Sodium compounds, n.e.s.: Sulfate, manufactured	--	734	1	China 400; West Germany 167.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	NA	1,104	--	Saudi Arabia 601; Italy 418; China 80.
Worked value, thousands	$1,108	--		
Gravel and crushed rock	NA	1,099	18	India 575; Netherlands 334.
Sulfur: Sulfuric acid	--	442	--	Netherlands 338; United Kingdom 86.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Liquefied petroleum gas value, thousands	$2,585	$4,049	--	Saudi Arabia $2,983; Yemen (Aden) $916.
Gasoline thousand 42-gallon barrels	NA	1,205	--	Saudi Arabia 588; Yemen (Aden) 206; unspecified 368.
Kerosine and jet fuel do	NA	1,074	--	Saudi Arabia 366; Yemen (Aden) 186; unspecified 521.
Distillate fuel oil value, thousands	$50,091	NA		
Lubricants do	$15,353	$17,452	$114	Saudi Arabia $6,546; West Germany $1,873; Spain $1,473.
Residual fuel oil thousand 42-gallon barrels	NA	14	--	Saudi Arabia 9; Yemen (Aden) 2.
Bituminous mixtures do	NA	311	(4)	Saudi Arabia 130; China 25; Spain 23.

NA Not available.

[1] Table prepared by Virginia A. Woodson.

[2] Unreported quantity valued at $15,000.

[3] Excludes unreported quantity valued at $6,509,000.

[4] Less than 1/2 unit.

The Mineral Industry of Other Areas of South America

By Travis Q. Lyday[1]

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ECUADOR

During 1983, Ecuador's gross domestic product (GDP) decreased by a reported 3.3% in real terms, the second consecutive decline in the economy after more than a decade of growth generated mainly by petroleum export revenues. The slowdown was due, in part, to the effects of the world recession, lower foreign demand for oil, depressed world oil prices, and reduced demand and prices for Ecuador's traditional agricultural exports. Inflation accelerated to an estimated 55% annual rate. The sucre was devalued in March, for the second time in less than a 12-month period, by 27% after remaining unchanged during the previous decade. In addition, continuous adjustments were made every weekday, effectively devaluing the sucre another 30% by yearend.

Ecuador's production of crude petroleum increased almost 12% in 1983 compared with that of 1982. Average daily production was 237,100 barrels per day (bbl/d), up from 211,300 bbl/d in 1982.

The consortium of Corporación Estatal Petrolera Ecuatoriana (CEPE), the state oil company holding a 62.5% interest, and Texaco Inc. (37.5%) produced almost 89% of the total from the northern part of El Oriente, the eastern jungle region; however, this represented almost a 10% reduction of the consortium's percentage of total Ecuadorean production, primarily owing to the increase in production from wholly CEPE-owned fields opened during the year. The CEPE-Texaco consortium operated 194 wells throughout its concession in El Oriente, with 75% of production coming from the Sacha and Shushufindi Fields.

The consortium comprised of CEPE and City Investing Co., part of the Clyde Petroleum Group, operated 11 wells in 3 fields in El Oriente and produced less than 2% of the country's total.

In addition to the two CEPE-involved consortia, CEPE operated its own fields both in El Oriente along the Colombian border and on the Santa Elena Peninsula on the Pacific coast. Production from El Oriente, which began in October 1982, was not quite 10% of total production in 1983. Commercial production from the Santa Elena Peninsula Fields began in 1921, but has been declining for several years. Production in 1983, pumped from 422 nearly depleted stripper wells, represented little more than 0.3% of total production. About 500 wells have been shutdown during the life of these fields.

The volume of crude petroleum exports increased almost 20% from the revised 42.7 million barrels in 1982 to 51.2 million barrels in 1983.

CEPE terminated its Gulf of Guayaquil hydrocarbons exploration contract with the Panamanian drilling company Permargo Internacional S.A., a unit of Perforaciones Marinas del Golfo de México S.A., at yearend 1982. CEPE spent a reported $41 million[2] on the gulf drilling project, resulting in three wells that contained no evidence of commercial quantities of crude oil or natural gas.

The fourth wildcat well, Balsaura-1, drilled in the southeastern Amazon region of Conambo, Pastaza Province, near the Peruvian border, was completed in November. The well yielded 15° to 21° API crude at up to a 1,500-bbl/d flow. The first three wells yielded only minimal amounts of heavy (10° to 15° API) crude.

At yearend, three U.S. oil companies were engaged in risk-contract negotiations with the Government on terms for the rights to explore for petroleum and natural gas, under the provisions of the hydrocarbons reform law passed in 1982.[3] The companies—Exxon Corp., in a joint venture with Enepetrol (Empresa Nacional de Petróleo S.A., the Spanish state oil company), Occidental Petroleum Co., and Belco Petroleum—submitted successful bids on 4 of 11 blocks in El Oriente and along the Pacific coast under Ecuador's first-ever risk offering, held June to October.

The Ecuadorean minerals sector, with production declining significantly in recent years, remained negligible in the country's economy in 1983, owing primarily to the lack of an acceptable mining law having sufficient incentives to attract foreign capital. A draft law, patterned after the 1982 hydrocarbons law, however, was under consideration by the Ecuadorean Congress at yearend 1983.

Representatives from Paranapanema S.A. Mineração, Indústria e Construção, the large Brazilian mining and construction company, held discussions with the private Ecuadorean company, Equaba S.A., about a possible joint exploration venture in El Oro Province, the "Province of gold" about 150 kilometers south of Guayaquil. Paranapanema would supply exploration and concentrator equipment for the project.

The first two 100-megawatt turbine generators were placed on-stream in May at the Río Paute hydroelectric plant, located 115 kilometers from the city of Cuenca, Azuay Province. The remaining three turbines were expected to be in operation early in 1984. The Paute project was expected to double Ecuador's energy capacity, replacing an estimated 75% of the electricity generated by petroleum, or about 2 million barrels. The Italian engineering firm, Impregilo, was in charge of the civil works.

Table 1.—Other Areas of South America: Production of mineral commodities[1]

Area and commodity	1979	1980	1981	1982^{p}	1983^{e}
ECUADOR[2]					
Cadmium, mine output, metal content kilograms	^{e}480	^{e}480	^{e}400	^{e}300	350
Cement, hydraulic thousand metric tons	1,099	1,389	1,450	^{e}1,400	1,350
Clays: Kaolin metric tons	^{r} ^{e}5,000	4,000	3,000	4,104	1,000
Copper, mine output, metal content do	^{r}666	^{r}923	825	143	193
Gas, natural:					
Gross million cubic feet	13,387	15,000	^{e}16,000	13,816	14,762
Marketable do	^{e}1,600	1,600	^{e}1,700	1,158	1,200
Gold, mine output, metal content troy ounces	^{r}2,251	^{r}225	^{r} ^{e}2,347	2,300	643
Gypsum (for cement) metric tons	6,000	6,000	2,000	^{e}2,000	2,000
Lead concentrates, metal content do	^{e}220	220	200	^{e}235	225
Natural gas liquids:					
Natural gasoline thousand 42-gallon barrels	NA	NA	NA	45	NA
Liquefied petroleum gas do	815	800	820	117	261
Total do	NA	NA	NA	^{e}162	NA
Petroleum:					
Crude do	78,169	74,714	76,797	77,106	86,341
Refinery products:					
Gasoline do	8,119	9,000	7,802	8,232	6,109
Jet fuel do	1,107	1,200	1,118	1,065	907
Kerosine do	2,498	2,500	2,205	2,531	2,059
Distillate fuel oil do	5,095	5,600	5,046	5,221	5,792
Residual fuel oil do	13,775	14,500	14,614	14,491	11,067

See footnotes at end of table.

Table 1.—Other Areas of South America: Production of mineral commodities[1] —Continued

Area and commodity	1979	1980	1981	1982[p]	1983[e]
ECUADOR[2] —Continued					
Petroleum —Continued					
Refinery products —Continued					
Lubricants thousand 42-gallon barrels	267	300	300	320	228
Other:					
Liquefied petroleum gas do.	225	250	733	646	382
Unspecified do.	367	400	417	460	430
Refinery fuel and losses do.	554	1,000	346	1,043	548
Total do.	32,007	34,750	32,581	34,009	27,522
Silica metric tons	[r] [e]16,000	[r]18,000	41,000	12,919	7,000
Silver, mine output, metal content troy ounces	35,366	28,936	32,151	[e]10,000	322
Steel, crude, excluding casting metric tons	[r]8,000	[r]17,253	27,686	27,768	22,000
Stone, sand and gravel:					
Limestone (for cement manufacture) thousand metric tons	2,000	[r]1,738	2,391	[e]1,200	1,500
Marble metric tons	2,000	[r]400	2,000	23	6,200
Sulfur:[e]					
Native do.	[r]3,300	[r]3,700	[r]20,000	4,500	5,000
Byproduct:					
From petroleum do.	5,000	5,000	5,000	5,000	5,000
From natural gas do.	5,000	5,000	5,000	5,000	5,000
Total do.	[r]13,300	[r]13,700	30,000	14,500	15,000
Zinc, mine output, metal content do.	1,027	629	742	91	123
FRENCH GUIANA					
Gold, mine output, metal content troy ounces	5,000	4,000	4,000	4,000	4,000
Stone, sand and gravel metric tons	[e]337,000	507,800	[e]320,000	400,000	400,000
GUYANA[2]					
Aluminum:					
Bauxite, dry equivalent, gross weight thousand metric tons	[e]2,312	[e]1,844	[e]1,681	1,430	[3]1,791
Alumina do.	200	220	170	[3]73	--
Diamond:[e] [4]					
Gem thousand carats	6	4	4	4	4
Industrial do.	10	6	6	7	5
Total do.	16	10	10	11	9
Gold, mine output, metal content troy ounces	10,593	11,003	19,262	7,347	5,377
PARAGUAY					
Cement, hydraulic thousand metric tons	155	177	161	110	100
Clays:					
Kaolin metric tons	40,000	50,000	70,000	55,000	50,000
Other thousand metric tons	1,870	2,200	2,400	2,100	2,000
Gypsum metric tons	[e]11,000	12,000	10,000	6,500	6,500
Lime do.	33,000	55,000	57,000	61,000	60,000
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	662	906	799	698	750
Jet fuel do.	94	101	132	69	100
Kerosine do.	132	120	176	88	100
Distillate fuel oil do.	1,705	1,931	1,931	698	750
Residual fuel oil do.	384	371	384	277	290
Liquefied petroleum gas do.	58	52	37	35	36
Refinery fuel and losses do.	731	800	[e]735	305	500
Total do.	3,766	4,281	4,194	2,170	2,526
Pigments, mineral: Natural: Ocher metric tons	200	200	200	120	150
Sand including glass sand thousand metric tons	2,300	2,600	2,650	2,300	2,400
Stone:					
Dimension do.	224	258	248	108	110
Crushed and broken:					
Limestone (for cement and lime) do.	300	350	335	270	280
Other do.	5,450	6,400	[e]3,600	2,500	2,600
Talc, soapstone, pyrophyllite metric tons	210	250	150	150	160
SURINAME					
Aluminum:					
Bauxite, gross weight thousand metric tons	5,010	4,646	4,100	3,059	1,750
Alumina do.	1,325	1,316	[e]1,200	1,172	1,200
Metal, primary[3] do.	64	46	32	60	[5]29
Cement, hydraulic do.	62	69	71	72	72

See footnotes at end of table.

Table 1.—Other Areas of South America: Production of mineral commodities[1] —Continued

Area and commodity	1979	1980	1981	1982[p]	1983[e]
SURINAME —Continued					
Clays:[e]					
Common metric tons	115,000	115,000	110,000	100,000	100,000
Kaolin[3] do	2,500	2,500	2,500	[e]2,500	2,500
Gold, mine output, metal content troy ounces	300	350	823	599	600
Sand and gravel:					
Sand, common thousand metric tons	150	155	[e]150	[e]150	150
Gravel metric tons	67,500	75,000	[e]70,000	[e]70,000	70,000
Stone, crushed and broken thousand metric tons	50	72	52	50	50
URUGUAY					
Aluminum, secondary metric tons	69	35	30	21	[5]24
Barite do	25	[r]15	30	80	25
Cement, hydraulic thousand metric tons	687	685	690	551	[5]401
Clays, unspecified metric tons	340,000	321,406	[e]300,000	278,821	300,000
Coke, gashouse[e] do	11,685	12,000	12,000	12,000	10,000
Corundum[e] do	227	187	220	45	100
Feldspar do	[e]2,700	2,820	[e]2,500	838	1,000
Fluorspar do	[e]77	81	[e]80	[e]80	80
Gas, manufactured[e] million cubic feet	750	760	750	750	700
Gem stones, semiprecious:					
Agate metric tons	[e]200	285	180	94	100
Amethyst do	[e]33	62	30	21	40
Iron and steel:					
Ferroalloys: Electric furnace ferrosilicon[e] do	150	150	150	150	160
Steel, crude do	16,127	[r]17,590	15,139	28,019	[5]15,912
Semimanufactures do	[r]64,454	[r]112,192	92,321	77,440	[5]57,707
Lime thousand metric tons	81	20	[e]50	14	[3]10
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	2,136	1,953	1,768	1,901	1,400
Jet fuel do	312	234	210	231	180
Kerosine do	1,119	1,032	861	804	450
Distillate fuel oil do	3,413	3,510	3,514	3,600	2,300
Residual fuel oil do	5.137	5,780	5,387	4,732	3,250
Lubricants do	49	45	46	50	30
Other:					
Liquefied petroleum gas do	417	447	396	445	250
Unspecified do	397	349	221	318	150
Refinery fuel and losses do	([6])	43	200	401	20
Total do	12,980	13,393	12,603	12,482	8,030
Sand and gravel:					
Sand:					
Common thousand metric tons	[e]2,200	2,964	[e]2,000	2,042	2,000
Glass metric tons	[e]1,700	258,188	[e]200,000	[e]200,000	200,000
Gravel thousand metric tons	[e]400	410	[e]350	506	370
Stone:					
Dimension do	[e]80	[r]15	10	9	45
Crushed and broken:					
Alum schist metric tons	[e]10,000	11,675	[e]11,000	6,320	6,500
Dolomite thousand metric tons	[e]120	81	[e]100	[3]14	60
Limestone do	[e]1,100	1,335	[e]1,250	1,098	1,000
Marble do	[e]5	8	[e]4	[e]5	6
Marl metric tons	[e]10,000	21,862	[e]11,000	11,480	11,000
Quartz do	([7])	7	[e]10	627	100
Other including ballast thousand metric tons	[e]1,500	2,028	[e]1,400	2,171	2,000
Sulfur, elemental, byproduct[e] metric tons	2,200	2,200	[r]2,000	2,000	2,000
Talc, soapstone, pyrophyllite do	[e]1,800	2,206	[e]1,700	1,145	1,200

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Includes data available through July 25, 1984.

[2] In addition to the commodities listed, a variety of crude construction materials (common clays, sand and gravel, and stone) undoubtedly were also produced, but output was not reported, and available information was inadequate to make reliable estimates of output levels.

[3] Data represent exports.

[4] Gem and industrial diamond production was estimated based upon reported total production.

[5] Reported figure.

[6] Refinery fuel apparently included with products for sale, mainly residual fuel oil and liquefied petroleum gas.

[7] Less than 1/2 unit.

FRENCH GUIANA

The mineral industry of French Guiana, an Overseas Department of Metropolitan France, remained insignificant to the local economy during the year. The sector was limited to the production of small quantities of construction materials for domestic consumption and a minor quantity of placer gold. Other known resources, expected to remain uneconomic for the foreseeable future, include: large deposits of bauxite in the Kaw, Rouri, and Mahury Mountain areas near the capital city of Cayenne; cinnabar; copper; widely dispersed, but relatively low-grade iron ore; manganese; molybdenum; nickel; and tantalite.

GUYANA

The Cooperative Republic of Guyana, long regarded as potentially one of the richest countries in the hemisphere, continued to have severe economic difficulties in 1983. The continued decline in exports, dominated by the three pillars of the economy, bauxite, rice, and sugar, together with a continued decline in imports caused by an inability to obtain adequate hard currency for finance, further aggravated the severe shortage of vital raw materials, machinery, and spare parts that has plagued the country for the last decade. At yearend, a flourishing parallel, or black market, contrasted sharply with the stagnation of the legal economy.

The state-owned Guyana Mining Enterprise Ltd. (GUYMINE) reportedly produced more than 1 million tons of bauxite during the year, well below the plus 4-million-ton capacity, at its open pit operations at Kwakwani (Berbice operations) and Linden. The Berbice operations commenced late in the year following the completion of overburden stripping. In addition to weak world market conditions, lower production was also due to a 6-week-long strike in midyear over working conditions and food shortages.

In an effort to halt the decline in bauxite production, the Guyana Bauxite Industry Development Corp. (BIDCO) contracted United States Engineers and Consultants Inc., a subsidiary of United States Steel Corp., and Kaiser Aluminum Technical Services Inc., a unit of Kaiser Aluminum & Chemical Corp., to study and recommend corrective actions to revitalize the country's main hard currency earner. Their reports were under review by BIDCO officials at yearend. Additionally, the Government was working with overseas companies on a blueprint, including possible partnerships, to improve the quality of performance in the management, technical, and marketing areas of the industry.

GUYMINE laid off more than 1,400 of its 6,000 bauxite workers in midyear in an effort to reduce the heavy losses suffered as a result of the lower production levels. A Government-appointed committee subsequently found employment for about 1,200 of the workers in the public and private sectors by yearend.

The U.S.-based Green Construction Co. reportedly signed a new contract with GUYMINE to continue management of the East Montgomery Mine at Linden. Green, which has been operating at Linden since 1980, concentrated on debushing, primary and secondary stripping, extraction and transportation of crude ore, and construction of an access during the year.

As a means of easing foreign exchange problems, the Government was planning to establish its own company to mine gold in the Essequibo region. Present mining is done exclusively by small miners using hand methods and small diesel-powered dredges. Yugoslavia was aiding the Government with its gold mining development plans. At yearend, the Government reportedly was planning discussions with Brazilian, Bulgarian, and Romanian officials on possible joint ventures in the gold industry. In an attempt to curtail the smuggling of gold, estimated to be as high as 90% of production, and diamond, estimated to be one-half of production, the Government promulgated compulsory registration of all miners in September.

Norman Mines Ltd. of Canada reportedly sought public financing to continue a gold exploration drilling program at its Marudi Mountain property. The company planned to conduct underground exploration drilling after driving an adit in Mazoa Hill. Rupununi Gold Mining Co., also of Canada, estimated reserves at Marudi in the 1940's at 230,000 tons of ore assaying 0.34 troy ounce per ton.

PARAGUAY

The Paraguayan economy, after leading all of Latin America in the rate of real GDP growth as recently as 1981, continued to decline for the second consecutive year, producing an estimated 5% contraction. The decline, as in 1982, was primarily caused by world recession and lower prices for Paraguay's principal exports, and a dropoff in expenditures as the large Itaipú hydroelectric project phased down. In addition, two other developments in 1983 further weakened the economy. First, early in the year the worst flooding in Paraguay this century severely damaged the cotton and soybean crops and practically prevented logging operations. Cotton, soybeans, and lumber, and products derived from them, are the country's principal exports. Second, severe import restrictions in Argentina and Brazil resulting from their continued financial crises further limited Paraguayan exports.

Inflation, according to preliminary estimates, increased to an annual rate of 17%, more than treble that of 1982.

The trade deficit decreased, after eight consecutive increases, declining almost 20% to an estimated $205 million,[4] owing to a deliberate effort to curb imports. Imports fell 21% to $459 million while exports declined 23% to $254 million.

Actual construction of the main civil works of the 2,700-megawatt Yacyretá hydroelectric plant, a binational venture with Argentina, located on the Río Paraná, was not initiated during the year; however, the project was formally inaugurated in a symbolic ceremony December 3 and construction was scheduled to begin early in 1984.

Entidad Binacional Yacyretá, the binational entity that will operate the Yacyretá plant through joint ownership, awarded the $1.4 billion civil works construction contract to a 32-company consortium of Argentine, European, and Paraguayan construction firms led by France's Société Dumez and Italy's Impregilo. The International Bank for Reconstruction and Development and the Inter-American Development Bank each have offered $210 million in financing and the U.S. Export-Import Bank was to provide $550 million in credits for U.S.-supplied machinery and equipment.

The estimated total cost to complete the entire Yacyretá project including navigation improvements on the Río Paraná, was revised upward slightly to $10.6 billion. An estimated $1 billion has already been spent for development of the remote site since the early 1970's.

The Yacyretá project will help replace thermal energy generation in Argentina, thus providing that country with a less expensive source of power. The plant will also provide Paraguay with substantial income from the sale of power to Argentina, as well as provide an additional source of power for its future needs.

The mineral industry of Paraguay continued to be limited to the production of a number of nonmetallic mineral commodities, including cement, common clays, gypsum, limestone for cement manufacture, sand and gravel, and stone, and the refining of imported crude at Petróleos Paraguayos S.A.'s (PETROPAR) refinery at Villa Elisa. PETROPAR is the mixed public-private petroleum company, which is the exclusive importer of petroleum in Paraguay.

Because of Paraguay's proximity to oil- and gas-producing regions in northwestern Argentina and southeastern Bolivia and because significant mineral deposits have been discovered nearby in Brazil, many experts have long believed that Paraguay could contain substantial hydrocarbon and mineral resources; however, much of the country has not been surveyed geologically using modern techniques and relatively little is known with certainty regarding the geology of the country. As a result, only minor occurrences of natural gas, uranium, and other minerals have been found.

Exploration for hydrocarbons began in 1944 when the Union Oil Co. of California obtained a concession in the Chaco, the western region of the country. Nonfossil fuel exploration began in 1976 when the Anschutz Corp. obtained a concession to explore the eastern half of the country, primarily for uranium. During this 40-year period of exploration activity, the Government issued prospecting permits and 41 wells were drilled by various companies—39 for hydrocarbons and 2 for other minerals. Except for two wells which had natural gas shows, but in impermeable rock and thus subsequently abandoned, all were either dry or barren of mineralization.

At the beginning of the year there were reportedly three firms holding hydrocarbon exploration concessions in Paraguay and two firms holding nonhydrocarbon concessions; however, by yearend one company had relinquished its concession to another hydrocarbon-concession holder and one firm had terminated its nonhydrocarbon concession.

SURINAME

The bauxite industry, including its derivatives alumina and aluminum, continued to be the mainstay of the Surinamese economy, accounting for about 80% of foreign exchange earnings and representing about 40% of Government revenues; however, the worldwide recession, combined with a severe drought affecting the production of electricity at the Afobaka hydroelectric plant near Brokopondo, adversely affected production in this sector during the year, and especially in production of primary aluminum. As a result, the decrease in Suriname's foreign exchange earnings became acute and the Government imposed new control measures, including expanding the list of prohibited items and requiring deposits of up to 50% of the invoice value.

The Surinamese bauxite industry was comprised of Suriname Aluminum Co. (SURALCO), a wholly owned subsidiary of the Aluminum Co. of America, and NV Billiton Maatschappij (BMS), a subsidiary of the Royal Dutch/Shell Group. SURALCO operated an intergrated aluminum industry with bauxite mines at Lelydorp and Moengo feeding the 1.4-million-ton-per-year alumina refinery at Paranam. In addition, some of the alumina produced was converted in the adjacent 60,000-ton-per-year aluminum smelter. BMS, however, operated as a mining company only, having the capability to produce 4 million tons of bauxite per year from its mines at Kankantrie and Pará.

BMS signed a letter of intent, in August, to buy a 45% interest in SURALCO's refinery. When finalized, the agreement would replace the contracts between the two companies under which SURALCO would convert up to 60% of BMS bauxite into alumina. In addition, BMS and SURALCO were negotiating a merger of their bauxite mining operations during the year. The Government would have to approve any agreements concluded between the companies prior to their taking effect, however.

Suriname's bauxite exports decreased more than 10%, to 447,857 tons in 1983 compared with 500,485 tons in 1982. Total alumina shipments decreased almost 3%, to 1,028,905 tons compared with 1,055,905 tons in 1982. Exports of aluminum decreased more than 50%, to 28,880 tons compared with 60,294 tons in 1982. The United States remained the largest purchaser of Surinamese bauxite and alumina; whereas, all aluminum shipments were made to Europe.

SURALCO, the sole producer and calciner in Suriname, shut down its abrasive-grade, calcined-bauxite kilns in November. Earlier, at yearend 1982, SURALCO stopped producing calcined refractory-grade bauxite owing to adverse market conditions. Although BMS continued to produce refractory bauxite during the year, it had no calcining operations in Suriname.

On December 19, Suriname's 7,000 bauxite miners and plant workers began a wildcat strike over large income tax increases imposed by the Government, thus bringing Suriname's aluminum industry to a complete standstill at yearend.

In addition to bauxite and its derivatives, minor quantities of gold and construction materials were produced in Suriname. A minimal amount of petroleum was also produced by the Government-owned State Oil Co.

URUGUAY

The 2-year decline in the Uruguayan economy moderated slightly in 1983. The GDP decreased an estimated 7% in real terms compared with the revised 10% decline in 1982. Positive economic growth in the 3% to 5% range was expected in 1984. Inflation, after declining for 4 consecutive years, more than doubled during the year to a 51% annual rate, owing in part to high domestic interest rates and the rapid rise in prices in the wake of the floating of the peso at yearend 1982.

A continued reduction in imports, led by a 40% fall in crude oil, combined with recovering exports during the year contributed to a trade surplus, the first in 10 years, estimated to be $200 million.[5]

The mineral industry was of minor importance to Uruguay's economy and continued to be concentrated in the nonmetallic sector in 1983.

The 14th and final generating turbine

became operational in May at the 1,980-megawatt Salto Grande hydroelectric plant, a binational venture with Argentina on the Río Uruguay. Construction began in 1974, with financial assistance from the Inter-American Development Bank, and the plant began producing energy in 1979 with the installation of the first turbine.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Ecuadorean sucres (S/) to U.S. dollars at the rate of S/54.55=US$1.00 as of Dec. 31, 1983.

[3] Lyday, T. Q. The Mineral Industry of Other Areas of South America. BuMines Minerals Yearbook 1982, v. 3, 9 pp. (preprint).

[4] Where necessary, values have been converted from the Paraguayan guarani (G) to U.S. dollars at the rate of G126=US$1.00.

[5] Where necessary, values have been converted from the New Uruguayan peso (NUr$) to U.S. dollars at the rate of NUr$43.38=US$1.00 as of Dec. 31, 1983.

The Mineral Industry of Other South Pacific Islands

By Travis Q. Lyday[1]

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FIJI

Mineral production in Fiji, a group of 322 volcanic islands and atolls of Melanesia in the southern Pacific Ocean, continued to be dominated by gold. However, the Fijian mineral sector remained a minor factor as a source of export earnings, Government revenues, and employment, generating only 1% of the gross domestic product (GDP), estimated as $1.2 billion.[2]

The largest and most important mining operation was the Vatukoula gold mine on the north side of Viti Levu, the main island. The Vatukoula Mine has been in production since 1932, producing about 3.8 million troy ounces of gold and 1.3 million troy ounces of silver to date. In April 1983, the large Australian mining firm, Western Mining Corp. (WMC), assumed operation of the mine in a joint venture with Emperor Gold Mining Co. Ltd., which operated the mine previously. The WMC takeover of the mine management was expected to bring in additional capital and technological expertise in order to modernize operations, increasing both efficiency and output. During the year, rate of recovery was only about 75% of the gold contained in the ore and only 40% of the contained silver. Mining at the Vatukoula Mine was done using both opencut and underground methods, with about 60% of the ore mined attributed to the underground operations.

Mineral exploration activity, after undergoing a general decline in the recent past owing to the worldwide recession and the slump in metal prices and markets, began to pick up during the year as several large mining firms made applications for new prospecting permits from the Mineral Resources Department of the Ministry of Energy and Mineral Resources. Newmont Pty. Ltd. of Australia requested acreage on the two largest islands, Viti Levu and Vanua Levu, as well as on the smaller islands of Kandavu and Ono. Utah Pacific Inc. of the United States applied for a prospecting license on one of the small islands in the Yasawa Group west of Viti Levu. Placer Development Ltd. of Canada and WMC also made applications for significant new prospecting acreage.

Although some mineralized areas have been located in the past few years on Fiji, no additional commercially viable resources have yet been identified. The large porphyry copper occurrence at Waisoi and the smaller ones at nearby Wainabama and Waivaka in the Namosi area near the south coast of Viti Levu continued to be investigated by Viti Copper Ltd., a joint venture comprised of Conzinc Riotinto of Australia Ltd. (CRA), Anglo American Corp. of South Africa Ltd., and Preussag AG of the Federal Republic of Germany.

Other mineral production in Fiji included coral and river sand, crushed stone and gravel, and limestone for cement manufacture.

Seven wildcat petroleum wells have been drilled in Fiji since exploration drilling began in 1980 with the spudding by Chevron USA Inc. of the Bligh Water No. 1 well. Although there were some distillate shows and gas traces, all were dry and subsequently plugged. At yearend 1983, only Pacific Energy and Minerals Ltd. of Australia was still engaged in hydrocarbon exploration, consisting of geophysical work and reinterpretation of older seismic data. Pacific Energy had a controlling interest in all four petroleum exploration licenses outstanding at yearend.

Table 1.—Other South Pacific Islands: Production of mineral commodities[1]

Area and commodity	1979	1980	1981	1982[p]	1983[e]
FIJI					
Cement, hydraulic metric tons	96,100	84,367	91,625	88,089	95,000
Gold, mine output, metal content troy ounces	[r]31,765	[r]23,939	30,595	46,821	50,000
Lime[2] metric tons	1,308	2,128	4,270	3,811	2,500
Silver, mine output, metal content troy ounces	[r]11,147	6,768	8,057	19,107	15,000
Stone, sand and gravel:					
Coral sand for cement manufacture metric tons	[r]122,567	105,436	93,514	99,895	95,000
River sand for cement manufacture do	70,683	30,631	27,307	29,773	28,000
River sand and gravel, n.e.s cubic meters	367,700	[e]370,000	[e]375,000	[e]380,000	375,000
Quarried stone do	205,071	[e]274,000	[e]210,000	[e]230,000	225,000
Tellurium metal kilograms	[e]22,700	11,350	--	--	--
KIRIBATI[3]					
Phosphate rock (all produced on Banaba Island) thousand metric tons	420	--	--	--	--
NAURU[3]					
Phosphate rock do	1,828	2,087	1,480	1,359	[4]1,684
NEW CALEDONIA					
Cement metric tons	56,650	55,927	50,154	53,181	60,000
Chromium: Chromite, gross weight do	12,281	2,188	4,270	49,826	90,000
Cobalt, mine output:					
Content by analysis[5] do	[r]3,006	[r]3,200	2,789	2,133	2,100
Recovered[6] do	[r]249	[r]358	369	271	270
Nickel:					
Ore:					
Gross weight thousand metric tons	[r]4,294	4,571	3,984	3,047	2,000
Metal content[7] metric tons	[r]79,994	86,592	78,090	60,101	39,500
Metallurgical products:					
Ferronickel:					
Gross weight do	123,306	131,281	109,679	108,606	70,000
Metal content (nickel plus cobalt) do	30,373	32,580	27,989	[r] [e]28,000	28,000
Nickel matte:					
Gross weight do	16,282	20,779	20,648	9,700	9,750
Metal content (nickel plus cobalt) do	12,262	15,479	15,380	[r] [e]7,000	7,100
Stone, sand and gravel:					
Stone:					
Crude (unspecified) cubic meters	104,051	104,706	19,422	19,600	19,000
Crushed do	73,435	140,079	83,000	91,000	90,000
Sand do	67,797	95,814	75,802	59,000	60,000
Silica (for metallurgical use) do	15,683	12,375	24,650	15,240	15,000
PAPUA NEW GUINEA[3]					
Copper, mine output, metal content metric tons	170,788	146,813	165,420	170,004	[4]201,876
Gold, mine output, metal content troy ounces	630,496	451,707	540,325	589,258	[4]579,407
Silver, mine output, metal content do	1,428,480	1,180,000	1,362,804	1,387,399	[4]1,524,360
SOLOMON ISLANDS[3]					
Gold do	1,076	1,093	1,050	1,318	1,100
Silver do	115	161	150	169	250

See footnotes at end of table.

Table 1.—Other South Pacific Islands: Production of mineral commodities[1] —Continued

Area and commodity	1979	1980	1981	1982[p]	1983[e]
VANUATU					
Manganese:					
Ore metric tons	112,400	--	--	--	--
Concentrate do.	10,544	--	--	--	--

[e]Estimated. [p]Preliminary. [r]Revised.

[1] Table includes data available through July 24, 1984.

[2] Produced from an unreported amount of domestically quarried limestone.

[3] In addition to the commodities listed, crude construction materials (common clays, sand and gravel, and stone) are produced, but output is not reported quantitatively, and available general information is inadequate to make reliable estimates of output levels.

[4] Reported figure.

[5] Cobalt content of nickel ores computed assuming average cobalt content to be 0.07% since 1975.

[6] Cobalt actually recovered for use as cobalt; excludes cobalt content of nickel-cobalt alloys and/or included in ferronickel.

[7] Nickel-cobalt content of ore produced as reported by New Caledonia's Mines Service. Of the total, about 97.323% is nickel; the balance is cobalt (based on average nickel-cobalt ratio in metallurgical products for 1880-1972).

Table 2.—Fiji: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	14	35	--	Mainly to Australia.
Copper: Metal including alloys, all forms	115	195	--	Do.
Gold: Metal including alloys, bullion troy ounces	28,143	45,833	--	All to Australia.
Iron and steel: Metal including alloys, all forms[2]	2,425	2,453	--	New Zealand 1,132; Tonga 1,090.
Lead: Metal including alloys, all forms	54	194	--	All to Australia.
Silver:				
Waste and sweepings value	--	$38,095	--	Australia $36,485.
Metal including alloys:				
Bullion troy ounces	8,330	17,680	--	All to Australia.
Unwrought and partly wrought value	$5,860	$1,874	--	All to New Zealand.
NONMETALS				
Abrasives, n.e.s.:				
Dust and powder of precious and semiprecious stones excluding diamond do.	$1,673	$763	--	Australia $509; Line Islands $142.
Grinding and polishing wheels and stones do.	$292	$682	--	Australia $488; Line Islands $172.
Cement	1,113	93	--	Tonga 50; Tuvalu 23; Line Islands 16.
Precious and semiprecious stones other than diamond value	$5,989	$41,201	--	New Zealand $28,614; Australia $12,129.
Salt and brine	10	540	--	Tuvalu 250; Line Islands 150.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	140	135	--	Western Samoa 38; Vanuatu 29; Tonga 26.
Naphtha do.	1	1	--	Mainly to Tonga.
Kerosine and jet fuel do.	[r]664	642	--	Tonga 34; Vanuatu 25; Cook Islands 21; bunkers 500.
Distillate fuel oil do.	[r]323	283	--	Western Samoa 46; Tonga 42; Vanuatu 24; bunkers 100.
Lubricants do.	[r]1	1	--	NA.
Residual fuel oil do.	49	73	--	Western Samoa 1; bunkers 72.
Unspecified do.	[r]2	(3)	--	Mainly to Tuvalu.

[r]Revised. NA Not available.

[1] Table prepared by Audrey D. Wilkes.

[2] Totals exclude unreported quantities valued at $21,430 in 1981 and $1,090,225 in 1982.

[3] Less than 1/2 unit.

Table 3.—Fiji: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	485	328	(2)	New Zealand 251; Australia 45.
Copper: Metal including alloys, unwrought and semimanufactures	89	93	1	New Zealand 47; Australia 24; United Kingdom 13.
Gold: Metal including alloys:				
Bullion troy ounces	357	1,128	30	United Kingdom 523; Singapore 400.
Unwrought and partly wrought do.	804	775	99	Australia 445; United Kingdom 97.
Iron and steel:				
Iron ore and concentrate including roasted pyrite	--	2,000	--	All from New Zealand.
Metal:				
Pig iron, cast iron, related materials	62	79	--	Hong Kong 74.
Ferroalloys	5	4	--	Mainly from Australia.
Steel, primary forms	8,413	9,110	65	Australia 4,509; New Zealand 4,507.
Semimanufactures:				
Bars, rods, angles, shapes, sections	4,586	4,183	1	New Zealand 1,694; Japan 1,208; Hong Kong 615.
Universals, plates, sheets	10,936	10,398	--	Australia 5,509; Japan 1,853; Hong Kong 900.
Hoop and strip	434	246	--	Australia 217; New Zealand 29.
Rails and accessories value, thousands	$681	$370	--	New Zealand $230; Republic of Korea $94.
Wire	1,880	2,232	(2)	Australia 993; New Zealand 835; Japan 212.
Tubes, pipes, fittings[3]	7,589	2,109	2	Australia 631; Taiwan 551; Japan 341.
Lead: Metal including alloys:				
Scrap	9	4	--	Australia 3.
Unwrought and semimanufactures value, thousands	$69	$106	(2)	Australia $42; New Zealand $35.
Nickel: Metal including alloys, all forms	42	2	1	United Kingdom 1.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	(2)	(2)	--	All from New Zealand.
Silver: Metal including alloys:				
Bullion	8	--		
Unwrought and partly wrought value, thousands	$6	$3	--	Australia $2.
Tin: Metal including alloys, unwrought and semimanufactures do.	$2,520	$1,940	--	Japan $1,926.
Titanium: Oxides	186	272	109	Australia 127.
Zinc:				
Blue powder value, thousands	$66	$35	$1	Australia $34.
Metal including alloys:				
Scrap and unwrought	[r]47	41	--	Australia 36.
Semimanufactures value, thousands	$68	$21	--	Australia $20.
NONMETALS				
Abrasives, n.e.s.:				
Dust and powder of precious and semiprecious stones including diamond do.	$137	$124	(2)	New Zealand $71; Australia $48.
Grinding and polishing wheels and stones do.	$148	$61	$3	New Zealand $24; Australia $22.
Barite and witherite	13	24	--	New Zealand 13; Australia 8.
Cement	9,239	8,005	--	Australia 7,947.
Chalk	128	125	--	New Zealand 47; Australia 42; United Kingdom 36.
Clays, crude	147	93	2	Australia 65; New Zealand 22.
Diamond: Industrial value	$10,284	$356	--	All from New Zealand.
Diatomite and other infusorial earth	62	42	13	Australia 15; Japan 10.
Fertilizer materials: Manufactured:				
Nitrogenous	48,215	45,579	188	Japan 45,051.
Phosphatic	11,645	13,706	19	Republic of Korea 9,605; North Korea 3,465.
Potassic	4,389	3,592	(2)	North Korea 2,000; Republic of Korea 1,055.
Unspecified and mixed	1,089	911	--	West Germany 579; New Zealand 266.
Gypsum and plaster	1,335	3,566	--	Australia 3,524.
Lime	36	192	--	New Zealand 158; Australia 34.
Precious and semiprecious stones other than diamond: Natural value, thousands	$119	$52	$7	Australia $20; New Zealand $9; Thailand $7.
Salt and brine	3,821	2,598	--	West Germany 1,956; Netherlands 383; New Zealand 214.

See footnotes at end of table.

Table 3.—Fiji: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	27	5	--	Australia 4.
Worked ---- value, thousands	$31	$32	--	New Zealand $23.
Gravel and crushed rock	8	308	(2)	Australia 303.
Sand other than metal-bearing	156	248	--	Australia 130; New Zealand 118.
Sulfur:				
Elemental:				
Crude including native and byproduct	128	136	(2)	Mainly from Belgium-Luxembourg.
Colloidal, precipitated, sublimed	[r]2	7	--	All from Australia.
Sulfuric acid ---- value, thousands	$66	$55	(2)	New Zealand $45.
Talc, steatite, soapstone, pyrophyllite	23	46	--	Australia 25; New Zealand 20.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,097	560	--	New Zealand 452; Japan 101.
Coal: All grades including briquets	18,354	22,724	1	Australia 18,169; New Zealand 4,554.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	35	38	--	Mainly from Australia.
Gasoline ---- do	506	506	--	Australia 367; Singapore 139.
Naphtha ---- do	30	23	--	Australia 13; Singapore 10.
Kerosine and jet fuel ---- do	[r]959	738	--	Australia 576; Singapore 162.
Distillate fuel oil ---- do	1,520	1,477	--	Australia 1,060; Singapore 417.
Lubricants ---- do	36	39	(2)	Australia 32.
Residual fuel oil ---- do	87	126	--	All from Australia.

[r] Revised.

[1] Table prepared by Audrey D. Wilkes.

[2] Less than 1/2 unit.

[3] Totals exclude unreported quantities valued at $1,449,579 in 1981 and $843,092 in 1982.

NAURU AND KIRIBATI

The Republic of Nauru, consisting of the 21-square-kilometer island of Nauru in Micronesia, is one of three great phosphate rock-rich islands of the Pacific, the other two being Banaba, part of the Gilbert Islands group, and Makatea, part of French Polynesia. The Republic of Kiribati, also in Micronesia, is comprised of the following three island groups: Gilbert Islands, Line Islands, and Phoenix Islands. Kiribati consists of vastly scattered coral atolls, many of which are uninhabited, totaling about 755 square kilometers of land area and stretching across approximately 5 million square kilometers of the Pacific Ocean.

Nauru has based its economy on the mining of its rich phosphate rock reserves, estimated to be about 30 million tons, and its GDP varies accordingly with the world market price of phosphate. The Government-owned Nauru Phosphate Corp. produced 1.68 million tons of phosphate rock from its opencut mine during the year, all of which was exported to Australia (68.4%), New Zealand (26.9%), Japan (3.4%), and the Republic of Korea (1.3%). The phosphate rock, which is vertically interdigitated with evenly spaced pillars of dolomitized coral limestone, was raised, or mined, by using grab buckets, leaving the coral as a "forest" of very hard rock pinnacles. Minor amounts of coral mined with the phosphate were removed by hand and used as road aggregate.

No production of phosphate rock has been reported from Kiribati since 1979, the year of independence, when the reserves were depleted.

NEW CALEDONIA

Mineral production in the French Territory of New Caledonia and Dependencies, comprised of the island of New Caledonia, the Isle of Pines, the Loyalty Islands, Huon Islands, and Chesterfield Islands in Melanesia, consisted principally of chromite and nickel. Minor amounts of cobalt were also recovered as a component of nickel matte from smelting operations in France.

The Doniambo smelter complex, owned by Société Métallurgique le Nickel, reduced its production rate 35% in July for the remainder of the year. Also reflecting the world slump in the nickel industry, the Népoui nickel laterite mine closed in midyear, and production was cut back at the Poro Mine.

Inco Metals Co., already renowned for its high-grade chromite concentrate, upgraded its product to 54% Cr_2O_3 with 4% or less silica as a result of improving the spiral separation plant at the Tiebaghi Mine. The Tiebaghi Mine, which was opened in 1982, was operating at its full 84,000-ton-per-year capacity at yearend. Inco reported reserves of more than 500,000 tons at Tiebaghi. In addition, Inco began reserve delineation drilling at its four nearby chromite deposits.

Table 4.—New Caledonia: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Destinations, 1982	
			United States	Other (principal)
METALS				
Chromium: Ore and concentrate	(2)	18,750	--	Mainly to Japan.
Copper:				
Matte and speiss including cement copper	217	249	--	West Germany 90; Australia 84; France 75.
Metal including alloys, all forms	(3)	1	--	Mainly to Wallis and Futuna Islands.
Iron and steel: Metal:				
Scrap	722	622	--	All to New Zealand.
Pig iron, cast iron, related materials	--	210	--	Do.
Ferronickel	110,036	191,932	9,815	France 158,829; Japan 14,951; Singapore 5,085.
Semimanufactures	130	264	--	Wallis and Futuna Islands 227; Australia 24.
Lead: Metal including alloys, all forms	--	15	--	France 14.
Nickel:				
Ore and concentrate thousand tons	1,385	1,232	--	Mainly to Japan.
Metal including alloys, unwrought	25,249	10,800	--	France 9,503; Japan 1,297.
Silver: Waste and sweepings[4] value, thousands	--	$6	--	France $4; Vanuatu $2.
Zinc: Metal including alloys, all forms	2	7	--	All to Wallis and Futuna Islands.
NONMETALS				
Fertilizer materials:				
Crude, n.e.s value, thousands	--	$2	--	Do.
Manufactured, nitrogenous	--	2	--	Do.
Precious and semiprecious stones other than diamond: Natural value, thousands	$1	$5	--	All to France.
Salt and brine	2	5	--	Wallis and Futuna Islands 4.
Stone, sand and gravel: Dimension stone, worked value, thousands	--	$1	--	All to Vanuatu.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	209	441	--	Mainly to Wallis and Futuna Islands.
Lubricants do.	330	343	--	Wallis and Futuna Islands 287; Fiji 14.
Bituminous mixtures do.	903	2,212	--	Vanuatu 1,879; Wallis and Futuna Islands 333.

[1] Table prepared by Audrey D. Wilkes.
[2] There were no exports in 1981; however, 7,292 tons were exported in 1980.
[3] Less than 1/2 unit.
[4] May include other precious metals.

Table 5.—New Caledonia: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals value, thousands	$1	$2	--	All from France.
Aluminum: Metal including alloys, all forms	387	196	1	New Zealand 64; France 48; Italy 23.
Copper:				
Matte and speiss including cement copper value, thousands	$3	$5	--	All from France.
Metal including alloys, semimanufactures	48	53	(2)	France 41; Netherlands 10.
Iron and steel: Metal:				
Ferroalloys	100	79	--	All from Australia.
Steel, primary forms value, thousands	$1	--		
Semimanufactures:				
Bars, rods, angles, shapes, sections	5,324	4,231	--	France 3,016; Belgium-Luxembourg 744; New Zealand 323.
Universals, plates, sheets	4,495	4,307	--	Australia 2,267; France 952; Belgium-Luxembourg 690.
Hoop and strip	362	207	--	Australia 151; Netherlands 37.
Rails and accessories	98	42	--	France 29; Belgium-Luxembourg 13.
Wire	560	944	--	New Zealand 560; Australia 267; France 114.
Tubes, pipes, fittings	2,711	1,357	(2)	France 844; Spain 233; Belgium-Luxembourg 82.
Castings and forgings, rough	22	64	--	All from France.
Lead: Metal including alloys, all forms	32	33	--	Australia 10; France 4.
Molybdenum: Metal including alloys, all forms value, thousands	$1	--		
Nickel: Metal including alloys, all forms do.	$3	$6	$1	Ireland $3; France $2.
Platinum-group metals: Metals including alloys, unwrought and partly wrought do.	$1	--		
Silver: Metal including alloys, unwrought and partly wrought do.	$17	$14	--	France $13; Switzerland $1.
Titanium: Oxides	15	25	--	All from France.
Tungsten: Metal including alloys, all forms value, thousands	--	$2	--	All from Australia.
NONMETALS				
Cement	43,428	43,681	--	Japan 43,498; France 174.
Chalk	20	90	--	All from France.
Clays, crude	29	11	--	France 4; Australia 3; New Zealand 3.
Diatomite and other infusorial earth	20	21	16	France 5.
Fertilizer materials:				
Crude, n.e.s	1	1	--	All from France.
Manufactured:				
Ammonia	4	6	--	Australia 3; France 2.
Nitrogenous	2,496	1,753	--	France 1,680; Australia 54.
Phosphatic	55	415	--	France 361; Australia 54.
Potassic	111	129	--	Belgium-Luxembourg 128.
Unspecified and mixed	45	22	(2)	France 11; Spain 6; New Zealand 4.
Gypsum and plaster	30,383	763	--	All from France.
Lime	14	250	--	New Zealand 215; Australia 19; France 15.
Magnesite	17	16	--	All from Austria.
Phosphates, crude	--	8	--	All from New Zealand.
Pigments, mineral: Iron oxides and hydroxides, processed value, thousands	--	$1	--	All from Australia.
Precious and semiprecious stones other than diamond:				
Natural do.	$128	$176	--	France $138; Brazil $8; India $8.
Synthetic do.	--	$2	--	France $1.
Salt and brine	440	679	--	Australia 253; West Germany 231; France 169.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	108	72	--	Italy 33; France 25; West Germany 14.
Worked	55	43	1	France 28; Republic of South Africa 8.
Dolomite, chiefly refractory-grade	--	62	--	All from France.
Gravel and crushed rock	80	83	--	France 65; Italy 18.
Sand other than metal-bearing	21	22	8	France 10.
Sulfur:				
Elemental: Crude including native and byproduct	5,445	--		
Sulfuric acid	39	55	--	Australia 31; France 24.

See footnotes at end of table.

Table 5.—New Caledonia: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1981	1982	Sources, 1982	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Coal: All grades including briquets	82,351	64,990	--	Australia 38,978; Republic of South Africa 26,012.
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	55,692	71,328	--	Australia 71,178; France 139.
Gasoline do.	747,099	794,758	NA	NA.
Kerosine and jet fuel do.	30,814	23,087	NA	NA.
Lubricants do.	17,990	21,840	364	Australia 12,026; France 553.
Residual fuel oil do.	1,924,174	1,355,810	1,026,865	Australia 328,851.
Bituminous mixtures do.	--	16,507	--	Singapore 16,410.

NA Not available.

[1] Table prepared by Audrey D. Wilkes.

[2] Less than 1/2 unit.

PAPUA NEW GUINEA

The mineral industry of Papua New Guinea, located in the southwest Pacific Ocean and comprised of the eastern half of the island of New Guinea, the Bismark Archipelago, Bougainville and Buka Islands in the Western Solomons, and the Trobriand, Woodlark, D'Entrecasteaux, and Louisiade Island groups to the east of the New Guinea mainland, consisted of copper and associated gold and silver. Of no importance to the economy of the country yet, but having large potential, were chromite, cobalt, and nickel. Exploration for hydrocarbons has been ongoing for a number of years, but thus far, quantities found have not warranted commercial exploitation.

Bougainville Copper Ltd.'s Panguna Mine, a joint venture of CRA (53.6%), the Papua New Guinean Government (20.2%), and private interests (26.2%), remained essentially the country's only active metal mine. As a result of the addition of two grinding circuits during 1982, Bougainville Copper was able to set a new world record of 48,216,546 tons of ore milled in a single flotation plant during the year. The increased tonnage also enabled record high production levels of copper, gold, and silver at the Panguna Mine, estimated to have accounted for 50% of foreign exchange earnings and to have represented 20% of the GDP, estimated at $2.1 billion.[3]

Development of Ok Tedi Mining Ltd.'s porphyry copper-gold-silver deposit, located on Mount Fubilan in the Star Mountains 25 kilometers from the Irian Jaya border, proceeded on schedule during the year. The Ok Tedi project, a joint venture comprised of Amoco Minerals Ltd. (30%), The Broken Hill Pty. Co. Ltd. (30%), Kupferexplorationgesellschaft mbH (20%), a Metallgesellschaft AG subsidiary, and the Papua New Guinean Government (20%), was planning to begin mining the rich gold-silver cap over the main porphyry copper deposit in May 1984 as the first stage of mining operations. First year production of gold was expected to be more than 700,000 troy ounces, while silver output was planned to be about 160,000 troy ounces. Copper production, scheduled to begin in 1986 when the gold cap is mined out, was planned to be 80,000 tons initially, expanding to 120,000 tons by 1990. Production from the 410-million-ton Ok Tedi ore body was expected to yield $6 billion from ore sales over the 25- to 30-year mine life.

Nord Resources Corp. was seeking a joint venture partner to participate in the development of the Ramu River chromite-cobalt-nickel deposit in Marum, near Madang on the island of New Guinea. Although the deposit, owned by Nord Resources and other U.S. companies (69.5%) and MIM Holdings Ltd. (30.5%), was the largest known chromite-cobalt-nickel deposit outside the Soviet Union and southern Africa, the cost of development and low prices for these strategic metals dictated the postponement of developing the deposit in the near future.

Small quantities of alluvial gold, by panning, and sand in the Bulolo Wau area were also produced during the year.

Table 6.—Papua New Guinea: Exports of copper in concentrates, by destination

(Metric tons of copper content)

Destination	1981	1982
China	2,961	8,394
Germany, Federal Republic of	56,150	64,593
Japan	85,019	79,586
Korea, Republic of	2,741	2,649
Spain	18,474	15,213
Unspecified	2,720	2,826
Total	168,065	173,261

SOLOMON ISLANDS

Mineral production of the Solomon Islands, a 1,450-kilometer chain of ruggedly mountainous volcanic islands and low-lying coral atolls in Melanesia, continued to be limited to the production of small quantities of construction materials— clays, crushed stone, and sand and gravel— used for domestic consumption and minor amounts of placer gold and silver. In addition, marine shells have been harvested for lime.

The mineral sector has had a small role in the Nation's economy, although resources of bauxite, chromite, copper, lead, manganese, nickel, phosphate, sulfur, and zinc are known.

No significant developments concerning the mineral industry of the Solomons during 1983 were reported, but it was assumed that the Government remained active in seeking foreign investment to develop its mineral resources and to explore for hydrocarbons.

TONGA

The mineral industry of the Kingdom of Tonga Archipelago, comprising about 150 islands covering an 800-kilometer north-south expanse of Polynesia in the southern Pacific Ocean, consisted of the construction materials coral reef limestone, crushed stone, and sand and gravel in minor quantities for domestic use. No other mineral resources are known. Exploration for hydrocarbons, begun in 1970 after discovery of natural crude oil seepages on the islands of Tongatapu and 'Eua in 1968, was assumed to have continued during the year. Samuel Gary Oil Producers Inc. of Englewood, Colorado, reportedly began drilling the first of three offshore wells in 1982 in its Tonga Platform concession.

VANUATU

The mineral industry of the Republic of Vanuatu, a chain of islands in Melanesia having a total area of about 12,000 square kilometers spread over a distance of 900 kilometers in the southwest Pacific Ocean, remained insignificant. The sector was limited to the production of small quantities of construction materials, including coral reef limestone, crushed stone, and sand and gravel. Mineral commodities, even during the active mining and concentrating of metallurgical-grade manganese ore for export to Japan during the 1961-78 period, have never had a very significant role in the country's economy.

The opencut manganese mine near the village of Forari, 55 kilometers northwest of the Port of Vila, Efaté Island, remained closed throughout the year. About 120,000 tons of ore, sufficient for about 3 years, remained when production ceased in November 1978. Other known resources, expected to remain uneconomic in the foreseeable future, include metallurgical-grade limestone on Espíritu Santo Island; manganese deposits, in addition to that of the Forari Mine, on Efaté and Erromango Islands; mineral sands containing ilmenite and magnetite on Pentecost Island; and large deposits of pozzolan, a volcanic ash used in cement manufacturing, on some of the islands, especially Ambrym and Efaté.

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[1] Physical scientist, Division of Foreign Data.

[2] Where necessary, values have been converted from Fijian dollars ($F) to U.S. dollars at the rate of $F1=US$0.96.

[3] Where necessary, values have been converted from Papua New Guinean kina (K) to U.S. dollars at the rate of K1=US$1.17.